

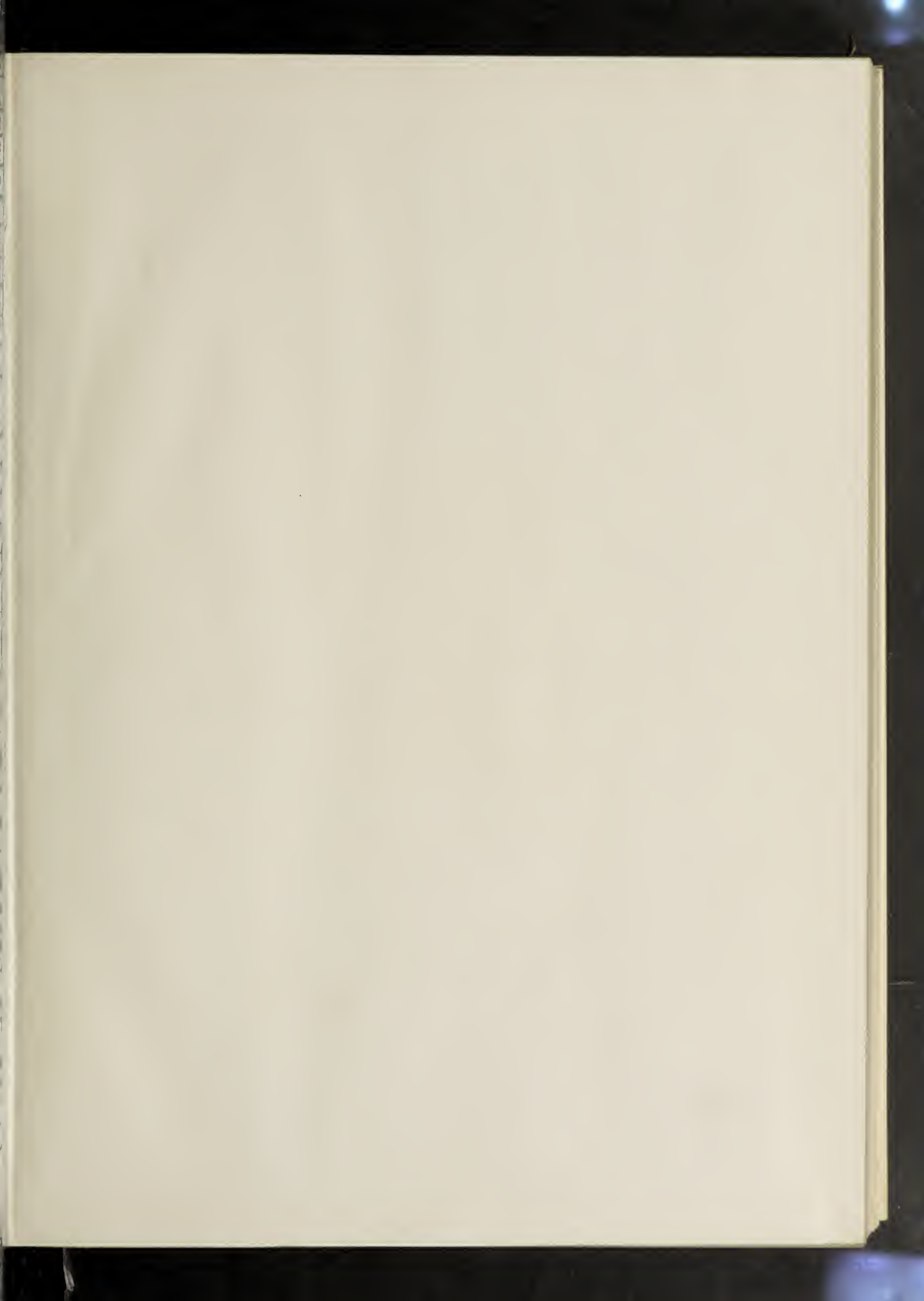


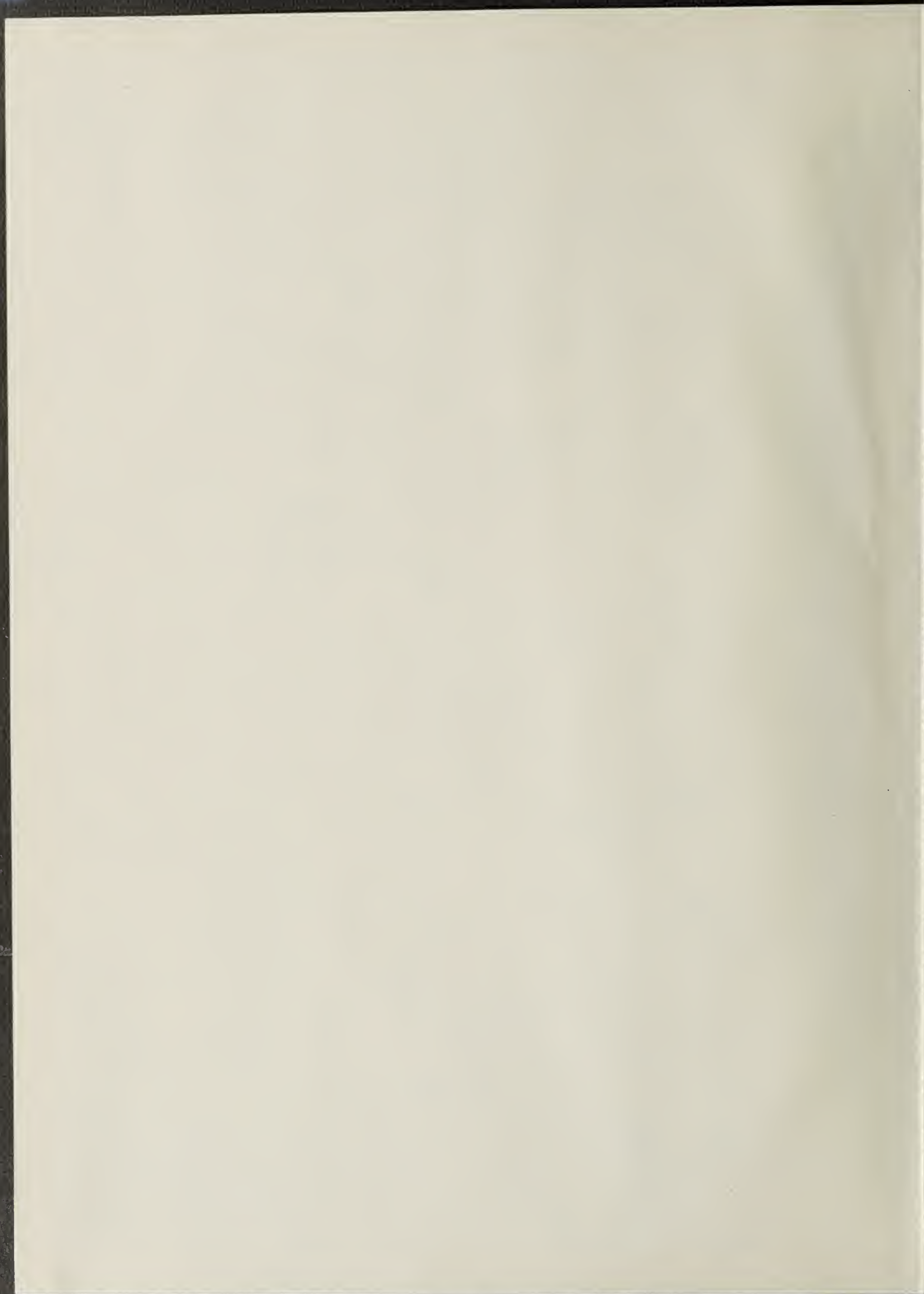
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REMOTE STORAGE
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CEMENT AND ENGINEERING NEWS

REMOTE STORAGE

Vol. 27

SCHILLER BUILDING, CHICAGO, JANUARY, 1915

No. 1

F. L. SMIDTH & CO. ENGINEERS

50 CHURCH STREET

NEW YORK CITY

Designers, Equippers and Builders of

Portland-Cement-Making Factories



THE STANDARD PAINT CO.

NEW YORK

BOSTON

CHICAGO

Send a Postal Today for Book 82

STUCCO made with



IS Waterproof &
NON-CRACKING

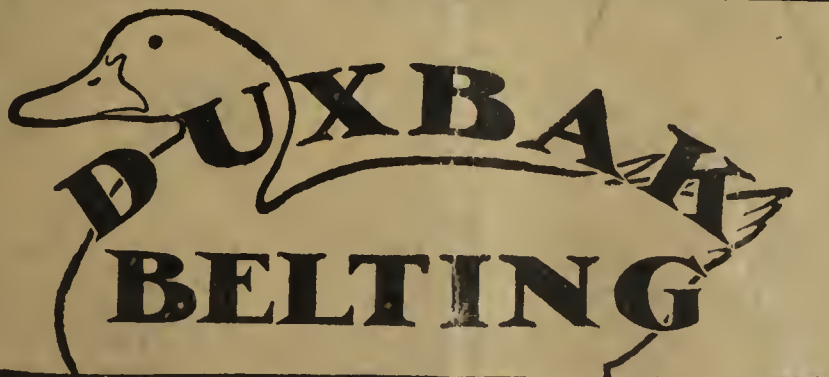
KRUPP

Grinding
Machinery

THOS. PROSSER & SON

24 Platt St., NEW YORK

Old Colony Bldg., CHICAGO



TRADE MARK

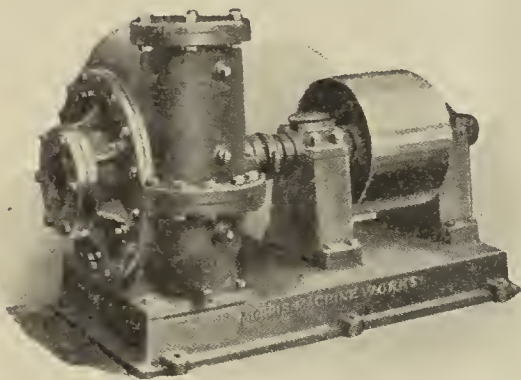
Chas. A. Schieren Com.
ESTABLISHED 1868

NEW YORK
30-38 Ferry St.
CHICAGO
128 W. Kinzie St.

MORRIS

Solid Lined

Dredging Pumps



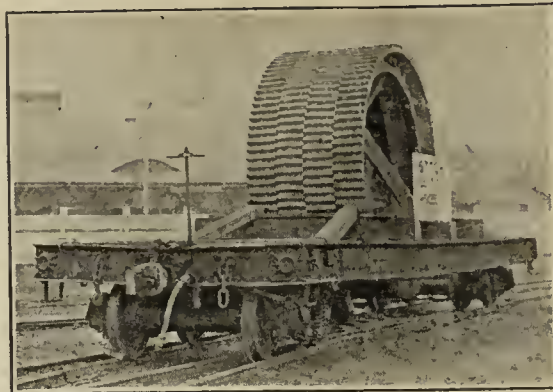
EVERYTHING that enters into the construction of the Morris Solid Lined Dredging Pump is of heavy proportions and the general design is such that wear is reduced to the smallest possible extent. Its ability to outlast other dredging pumps is its chief claim to economy.

By removing the upper half of the pump shell, the lining can be taken out or by removing the disc on the pump shell and the inner disc on the lining, the runner can be taken out. The pump is easily and quickly taken apart if necessary to replace lining or piston.

Write for Sand and
Gravel Pump Catalog

Machine

Stroh Process



First shipment of gears for Universal-Portland Cement Company's plant of Duluth which is being equipped with Stroh Process Gears and Pinions.

Pinions and Gears

Grinding Plates

Crushing Plates

Track Wheels

Sprockets

Sheaves

Liners

Mantles

Concaves

WEAR-PROOF - LOW PRICED



Trade Mark
Registered



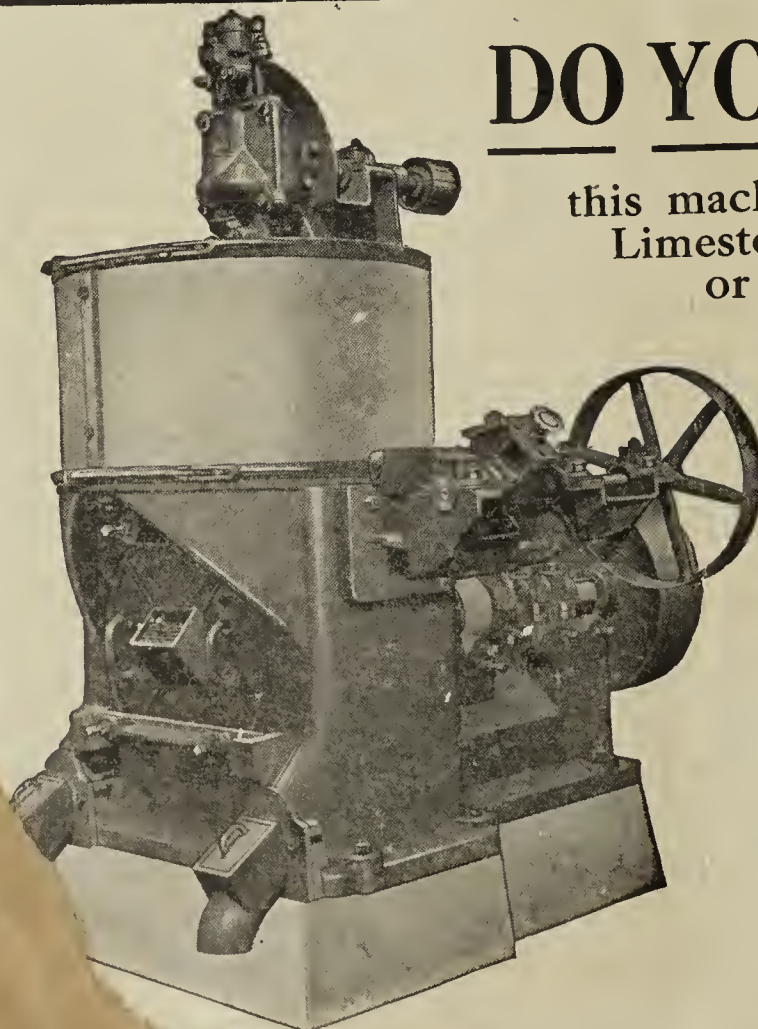
Fracture of
Involute Tooth

MADE EXCLUSIVELY BY

Stroh Steel-Hardening Process Co.
PITTSBURGH, PA.

DO YOU KNOW

this machine will grind
Limestone, Clinker
or Coal and



FINISH IT
AT ONE OPERATION?

6-8 Tons Limestone
12-15 Bbls. Cement
PER HOUR

**SIMPLIFIES
EQUIPMENT**

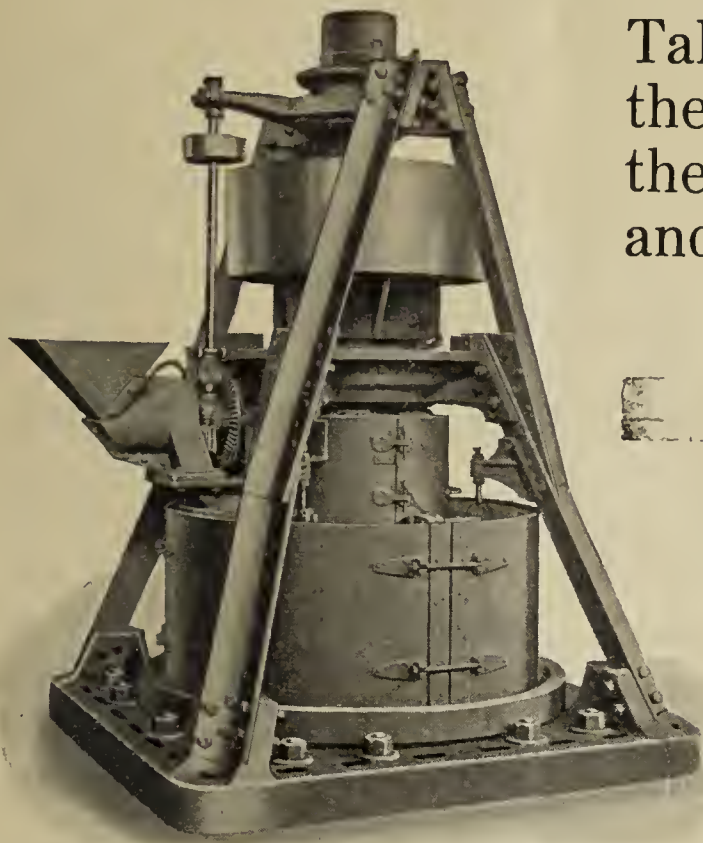
The BONNOT CO.

CANTON, OHIO

909 New York Life Bldg.
KANSAS CITY - - MO.

The Real Satisfactory Clinker Finisher

The Giant Griffin Mill



Takes clinker of a size that comes from the kiln; pulverizing in single operation thereby eliminating preliminary grinding and other auxiliaries—

Output from 10-13 barrels per hour.

Horse power 60-70.

Lowest cost for maintenance.

Operated by successful Cement Manufacturers in all parts of the world for pulverizing raw material, coal and clinker.

Bradley Pulverizer Co., Boston

Manufacturers of the Bradley Hercules Mill



SAND-GRAVEL DREDGING PUMPS

are our specialty. We build a full line of Standard Pumps for the most common requirements as well as a complete line for High Heads, either Motor Driven or Engine Driven.

Ask for Bulletin C-30. It Tells You More About Them.

ERIE PUMP AND EQUIPMENT CO.

Successors to the Erie Pump and Engine Works

Erie, Pa.



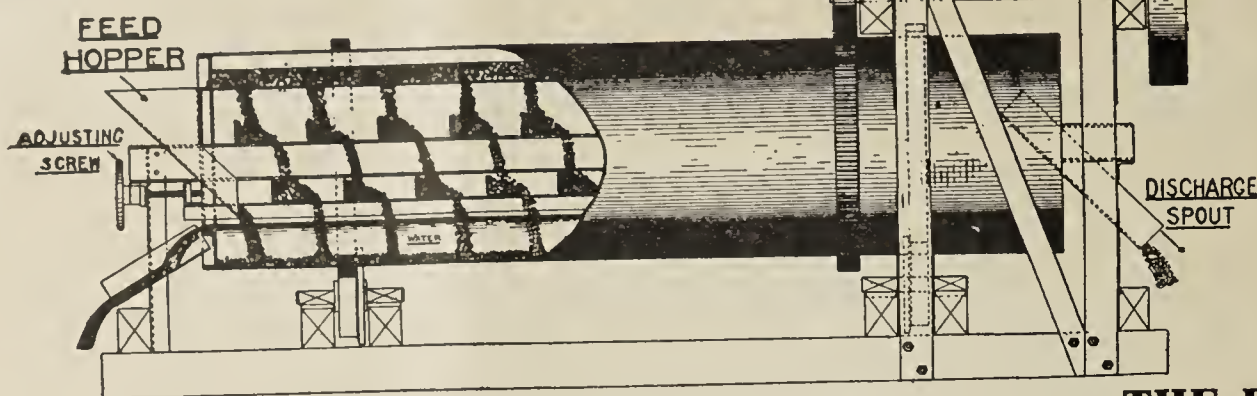
*Concrete for
Permanence*

Living Rock!

plastic at your wish — eternally hard at your direction — that is Atlas Portland Cement, valued wherever cement is known as "the standard by which all other makes are measured."



DULL IMPROVED TUBULAR GRAVEL WASHER



The drawing above gives a general idea of the design of the Dull Improved Tubular Washer. The operative principal is that of tumbling the material about in a bath of water as they progress through the length of the cylinder.

Convert Bank Sand and Gravel into A 1 Concrete Material by Washing It Yourself

A durable washer for contractors' use. Produce your own clean aggregates.

Dull Improved Tubular Washers are built regularly in diameters from 30 to 60 inches with lengths of 8 to 20 feet.

A Special Booklet Sent on Request

THE RAYMOND W. DULL CO.
1912-1914 Conway Bldg., CHICAGO

NON-FADING—STRONG—DURABLE CEMENT and MORTAR COLORS

To secure an absolutely Non-Fading Mortar Color has been one of the chief aims of architects and builders for years. Probably nothing in their line has so vexed them or caused such disappointment as has this one item. Realizing the full importance of this problem the competing manufacturers listed below have concentrated their efforts toward its correct solution and their success is attested thru the repeated use of their colors by reputable architects and builders throughout the entire country.

RED — BROWN — BUFF and BLACK

*Samples, Quotations and Information on "HOW TO USE and MIX MORTAR COLORS"
May be Secured from Any of the Following Competing Manufacturers of Mortar Colors*

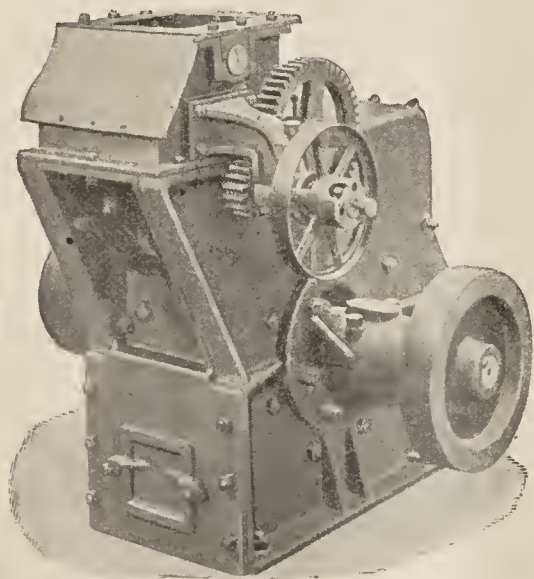
THE PRINCE MFG. CO.
165 Broadway, New York

C. K. WILLIAMS CO.
Easton, Pa.

CHATTANOOGA PAINT CO.
Chattanooga, Tenn.

PULVERIZATORS

FOR PULVERIZING RAW MATERIALS



Any capacity, producing 50% to 65% of product through 200 Mesh Sieve, increasing tube mill output, fineness, and value of your product. Write for Bulletin No. 4028, describing Pulverizators — pulverizing by a new principle.

Chalmers Manufacturing Company

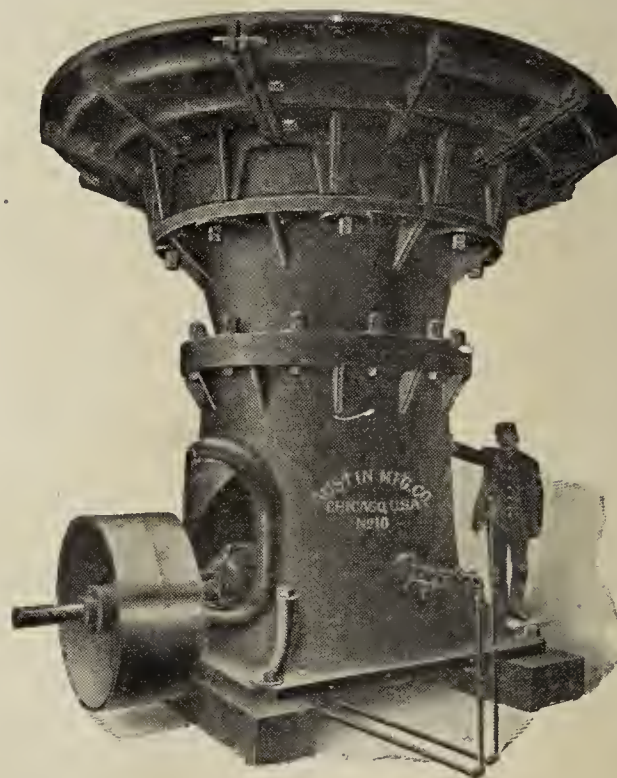
MILWAUKEE, WISCONSIN
Selling in All Principal Cities

Refer to Canadian Allis-Chalmers, Limited,
Toronto, Ontario, Canada

Representatives

Hay Street, Perth, West Australia
Frederick Street, Sydney, N. S. W.
Wall, E. C., London, England
Villa 2653, Santiago, Chile

Austin Gyratory Crushers



The world's leading Ore and Rock Crusher. Its many superior qualities and mechanical advantages have won the highest reputation amongst Mining Engineers and Quarrymen.

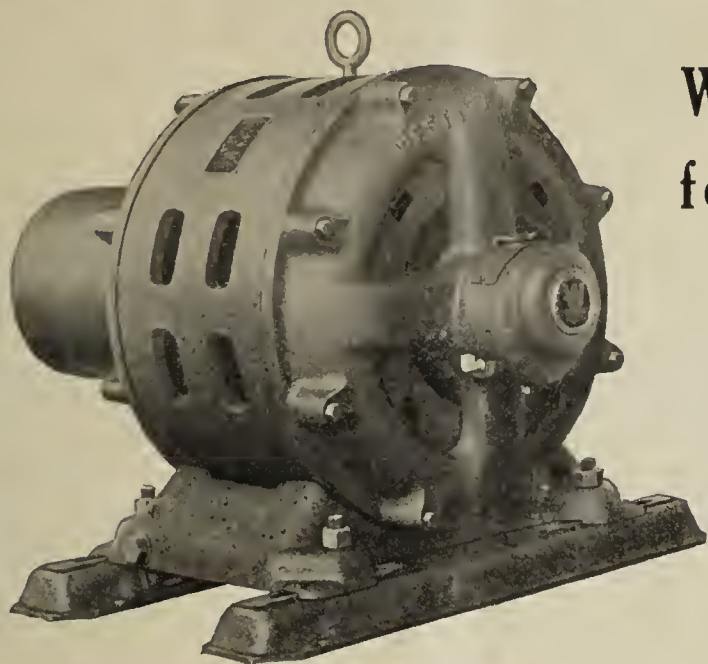
Made in NINE sizes with capacities from 50 to 5000 tons per day. Smaller sizes can be mounted as Portable Plants. Thousands in use. Plans and specifications furnished for any size of Plant.

Austin Manufacturing Company

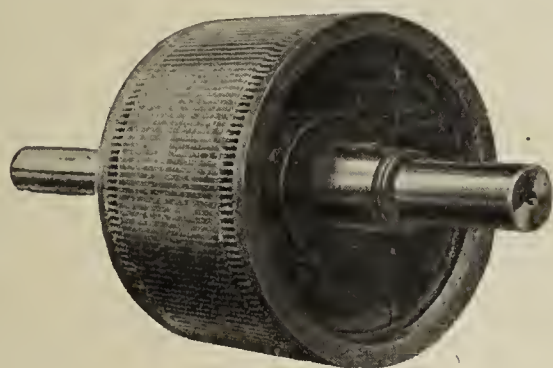
CHICAGO —:- NEW YORK
Canadian Agents—Mussens, Ltd., Montreal,
Toronto Winnipeg Calgary Vancouver

A New Westinghouse Motor

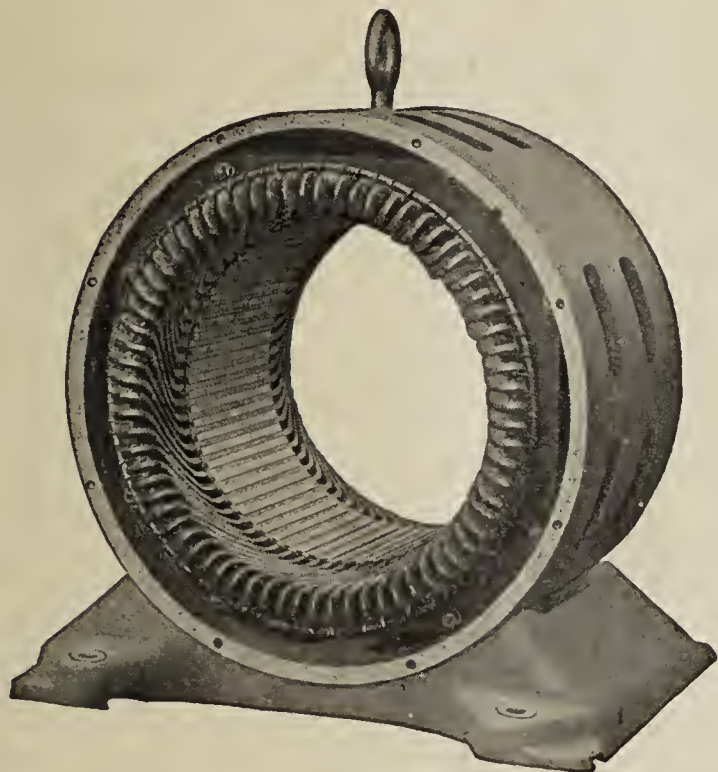
Which We Believe to Be the Best Motor
for Cement Mill Service Ever Built



Motor Complete



Rotor of Motor



Stator of Motor

In developing this motor our aim was to produce one that would give the user the highest degree of successful service.

Before it was placed on the market a series of tests, which lasted over a period of two years, was made. During these tests the motor was subjected to severer conditions than any encountered in cement mill service.

This motor has great mechanical strength, is light in weight because of its pressed steel frame construction, and, in spite of the fact that in normal service it will hardly ever need repairs, it is arranged so that repairs can be easily made.

The use of the open slots and form wound coils for the stator makes rewinding a simple matter. All parts that may need renewal are interchangeable as far as possible and can be quickly replaced.

The shafts are extra large; the bearings have very liberal areas and are thoroughly protected from dust. The rotor is practically indestructible.

All commercial sizes of this motor are carried in stock ready for quick shipment. A request to our nearest office will bring you full information.

Westinghouse Electric & Mfg. Co. East Pittsburgh, Pa.

ATLANTA, GA.
BALTIMORE, MD.
BIRMINGHAM, ALA.
BLUEFIELD, W. VA.
BOSTON, MASS.
BUFFALO, N. Y.
BUTTE, MONT.
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CHARLOTTE, N. C.
CHICAGO, ILL.

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CLEVELAND, O.
COLUMBUS, O.
*DALLAS, TEX.
DAYTON, O.
DENVER, COL.
DETROIT, MICH.
*EL PASO, TEX.
*HOUSTON, TEX.
INDIANAPOLIS, IND.



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KANSAS CITY, MO.
LOUISVILLE, KY.

LOS ANGELES, CAL.
MEMPHIS, TENN.
MILWAUKEE, WIS.
MINNEAPOLIS, MINN.
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OMAHA, NEB.
PHILADELPHIA, PA.
PITTSBURGH, PA.
PORTLAND, ORE.

ROCHESTER, N. Y.
ST. LOUIS, MO.
SALT LAKE CITY
SAN FRANCISCO
SEATTLE, W.
SPOKANE, W.
SYRACUSE
TACOMA
TOLEDO
WASHINGTON

*Westinghouse Electric & Mfg. Co. of Texas

Compactness and Sturdiness Mean Greater Efficiency



The "Excelsior"

was designed and built to set a fast pace for the higher priced mixers and contractors say it does. Equipped with low hopper; friction clutch; dust proof bearings; 3 H. P. engine. Can be equipped with hoist at small additional cost. Capacity $4\frac{1}{2}$ feet mixed material per batch; easily 65 cu. yds. per day. Write for illustrated catalog and judge for yourself the extra value of the EXCELSIOR.

Good territory open for agents

Excelsior Mixer & Machinery Co.

606 Merrill Bldg.

Milwaukee, Wis.

AGENTS: Universal Steel Products Co., Chicago, Ill. L. & D. P. Smith, Valdosta, Ga. Loyal Power Co., Omaha, Neb. Manufacturers Supply Co., Minneapolis, Minn. Ward Equipment Co., Pittsburgh, Pa. E. W. Ripley, Farmington, Me.

Contractors Stop! Look! Listen!

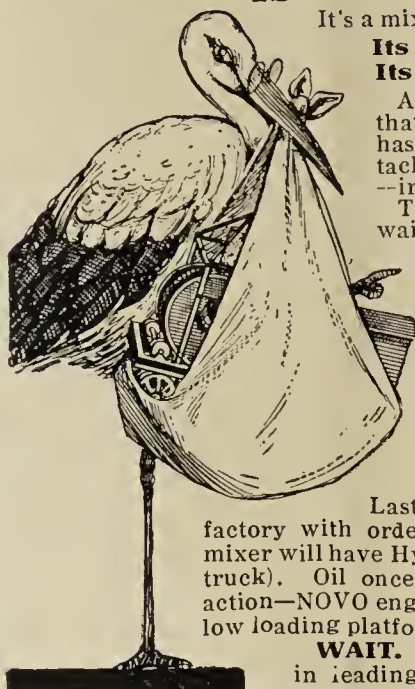
**THE GREATEST MIXER SENSATION
IS DUE TO ARRIVE JAN. 1ST**

It's a mixer we are proud of—

**Its Father Is Mr. High Quality
Its Mother Is Mrs. Popular Price**

A speedy thorough mixing machine, that does not stop—discharges fast—and has quality features and labor saving attachments not found in any other mixer—irrespective of price.

This is no usual Proud Father Talk—wait and see.



**"LIGHT WEIGHT"
BOSS
STEEL KING**

It More Than Lives Up To Its Name

Last year its low price flooded our big factory with orders. NOW LISTEN—This year, this mixer will have Hyatt Roller Bearings (like a 5-ton Auto truck). Oil once a week—new fast re-mix mixing action—NOVO engines, with 20% excess power—hinged low loading platform—and the price—wait and see.

WAIT. Full page advertisements will appear in leading papers in January—Our literature and low price proposition ready Jan. 1st or sooner—Don't buy a mixer without seeing the BOSS—Write today—We will send complete facts as soon as the printers get literature out.

AMERICAN CEMENT MACHINE CO., Inc.

9635 JOHNSON ST.

KEOKUK, IOWA

WHACK!

The POLK-GENUNG-POLK COMPANY

has formally declared war on the high cost of circular monolithic concrete construction. The first big broadside was fired on November 23, 1914, when, after a meeting of the Directors, it was announced that the

POLK SYSTEM MACHINES

would be sold at greatly reduced prices. In order to secure the benefit of these special prices it is necessary that the order be booked prior to February 17, 1915, the closing date of the Chicago Cement Show. Details of this special sale plan will be gladly furnished on request.

Genung-Polk Co., Fort Branch, Indiana

Supremo Conveyor Belt

Adapted for all general requirements such as conveying gravel, cement, clinkers, crushed stone, grain, clay, wood-pulp, salt, tailings, etc. It is far above the so-called standard belt, and one that has given general satisfaction under more than ordinary conditions.

There is a diversified list of uses for Conveyor Belting. We have carefully studied the different conditions and materials and stand ready to construct a belt for the duty to be imposed, which is often of an abusive character. Conveyors for hot cement, hot coke or slag, crushed stone, silica sand, etc., represent a few of the extreme cases.

MANUFACTURED BY

Revere Rubber Company
Chelsea, Mass.



Repair Parts For Cement Mill Machinery Our Specialty

Tube Mill Feeders
Griffin Mill Roll Heads
Ball Mill Plates for Krupp Mills
Kominuter Plates for Smidths Mills
Steel Balls for Kominuters
McCaslin Conveyer Wheels with "Coplan" Self-Lubricating Bushings
Lining Plates for Bonnot Tube Mills
Parts for Bonnot Pulverizers
Screw Conveyer Bearings
Eccentric Hubs, Crusher Heads and Concave Strips for Gates Crushers
T. M. Revolving Feeders (new style) for Gates Tube Mills

Patterns for all these lines kept on hand.

HULL IRON & STEEL FOUNDRIES
(LIMITED)

HULL, QUE.

Manufacturers of "Adamantine"

Chrome and Manganese Steel Castings
Machine Moulded Gears up to 16 ft.

We solicit your patronage and prompt attention will be given to tenders on above work.



*Jeffrey
Overlapping
Pivoted
Bucket Carrier,
Continental
Portland Cement
Co.,
Carondelet,
St. Louis, Mo.*

An Ideal Combination Elevator-Conveyer
for Boiler House and Cement Mill Service

Jeffrey Pivoted Bucket Elevator-Conveyers

Require Minimum Power Consumption,
Maintenance Expense and Attention

The pivot connection permits the buckets to carry their loads in a level position with the conveyer running in straight lines, curves, or at any angle to the horizontal or vertical.

Made in several sizes for small, medium and large capacities.

Bulletin No. 32-A upon request

JEFFREY MFG. CO., Columbus, O.

1-1-15



Heavy Equipment for Heavy Service

Cement Mills must run twenty-four hours every day in the dustiest, dirtiest, hardest conditions in which machinery can be operated.

**Freedom from
Breakdowns and Delays
means**

More Production—More Profits

Most cement mills specify



**Elevating, Conveying and Power
Transmission Machinery**

Catalog K-20

Weller Mfg. Co., Chicago

NEW YORK
50 Church St.

BALTIMORE
Garrett Bldg.

ST. LOUIS
520 Victoria Bldg.

DALLAS
711 Main St.

SAN FRANCISCO
1015 Monadnock B

**Make Night Work Light Work
TURN NIGHT INTO DAY**

BY USING

BUCKEYE CARBIDE LIGHTS

From 500 to 10,000 Candle Power
at a cost of less than one cent
for each 1,000 c. p. per hour.

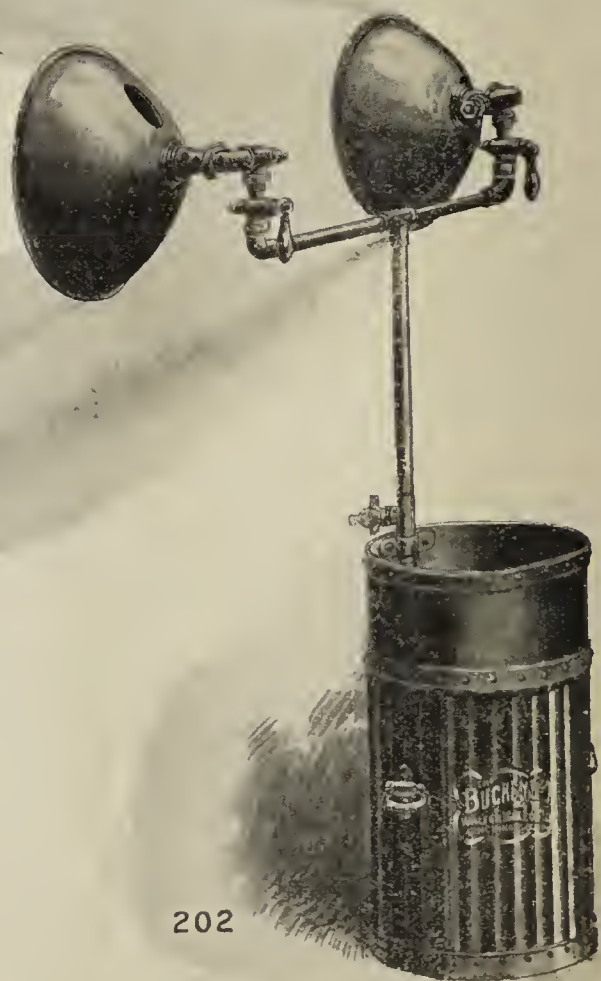
*Thousands in Daily Use
by the Largest Firms*

Write for Catalog No. C. E. 1 today to

THE MACLEOD CO.

215 East Pearl Street

CINCINNATI, OHIO



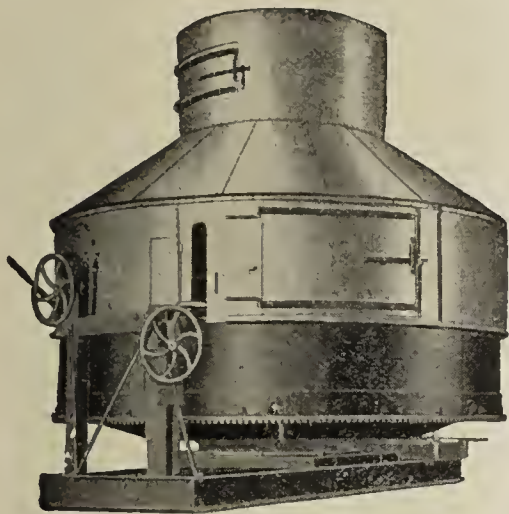
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TRADE
MARK**- OBSTITCH -**Reg. U. S.
Pat. OfficeWith Patented Diamond
REINFORCEMENT**"THE BEST TEXTILE BELT IN THE WORLD"**For Cement Mills, Stone Crushers, Pulverizers,
Brick, Gypsum, Fertilizer Plants, and
General Transmission**MOUNT VERNON BELTING COMPANY**

LICENSEES

327-333 WARREN AVENUE,

BALTIMORE, MD.

Clyde Hydrator with Hood
"The Common Sense Way"**SIMPLICITY IS THE KEYNOTE
OF SUCCESS**

IT does not take a "master mind" to install a CLYDE Hydrating plant, nor does it take a "high priced" engineer to run one. If **YOU**, Mr. Lime Manufacturer, realized how simple it is to obtain a **PERFECT HYDRATE**, with the **CLYDE HYDRATOR** you would place your order with us by **FIRST MAIL**. Write us today—**NOW**, and let us explain to you what **CLYDE PROCESS** hydrated lime is and how to obtain the best results, then

*Use your own judgment—it's up to you***H. MISCAMPBELL - Duluth, Minn.**

Patentee and Sole Manufacturer

There are no cemented joints to weaken the strength of "**Veelos**" Balata Belting.



"**Veelos**" Balata Belting is the strongest belt known to engineers, having a tensile strength of more than 9000 pounds to the square inch.

This belt is especially made for the hardest kind of service, such as cement mills, stone crushers, gravel plants, etc.

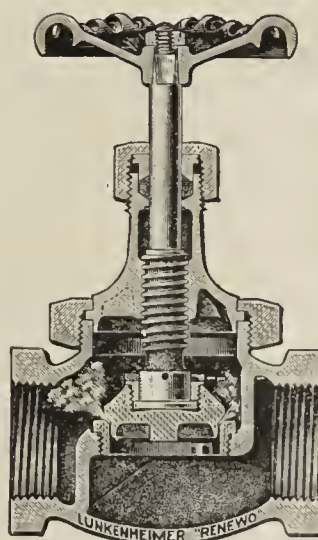
It is waterproof, you can run it in water or in the rain, without doing the least injury to the belt.

It does not stretch or shrink, you need not lose time and money in shortening this belt.

Every foot guaranteed, money refunded if not satisfactory.

Write for samples and prices.

Manheim Manufacturing & Belting Co.
Manheim, Lancaster Co., Pa.

LUNKENHEIMER**"RENEWO"
VALVES**

"The sum total of all good features in valve construction discovered and developed in over half a century of valve manufacture."

All parts renewable, including the **Nickel Seat and Disc**. Seating surfaces regrindable.

Lunkenheimer "seatguard"—the tubular extension on bottom of disc, materially aids in preserving the seat-

ing-faces and keeping them clean.

Body and trimmings (except disc, seat and hand-wheel) are made of the genuine and original Lunkenheimer steam bronze.

Lunkenheimer "**Renewo**" booklet gives details. Write for a copy.

Sold by leading supply houses everywhere.

THE LUNKENHEIMER CO.
—"QUALITY"—

*Largest Manufacturers of High Grade
Engineering Specialties in the World*

CINCINNATI, OHIO

New York

Chicago

Boston

London

1-15-D

LITTLE GIANT MIXER

Our Model A, shown herewith, is the most practical Hand Power Mixer on the market. Its blend is perfect and will stand the closest inspection. Its capacity depends upon the power at the crank. A man can turn out from 3 to 5 yards per hour. An engine will double this capacity. We can furnish engines also.

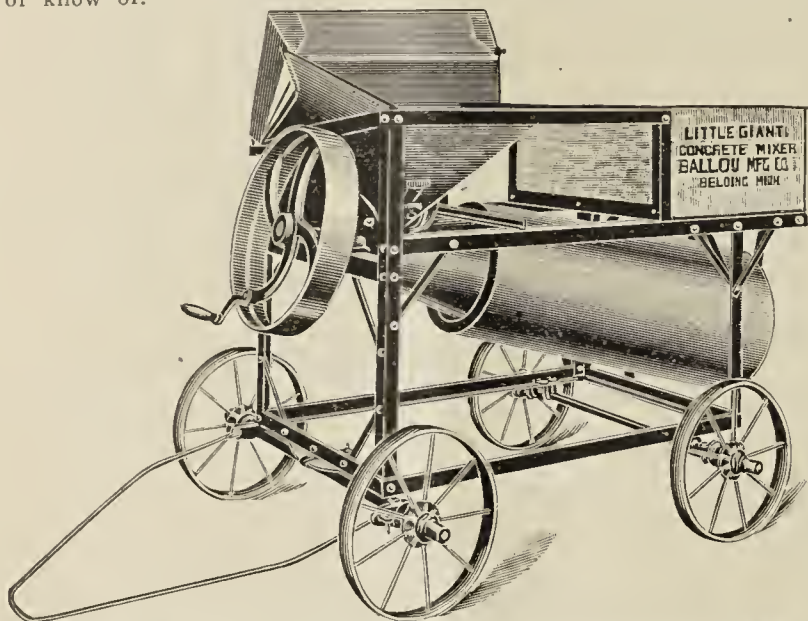
"I have used the Little Giant Hand Power Mixer for two seasons," writes I. J. H. Fender, Coral, Mich. "I have been well satisfied with the ease of operation and the quality and product of the concrete produced."

"With this mixer I put in 260 yards of concrete in two and one-half days on a road bridge in Howard City, Mich."

"I have been using the Little Giant Mixer continuously for all classes of foundation work, and in my block factory for making blocks, bricks and vaults."

"Previous to buying this Little Giant Mixer I bought a batch mixer but discarded it in a short time as it was too slow and practically worthless as a money maker."

"This Little Giant Mixer is a marvel in simplicity, for quality of concrete produced, and the smallness of expense for upkeep, and I would not change it for any other mixer that I have seen or know of."



BALLOU MFG. CO., 99 High Street, BELDING, Mich.

Build Culverts Like This

New York State has the best Culverts in the U. S. A. Every worth while thing in the world is built upon a universal plan.

THE ORIGINAL COMPLETE COLLAPSIBLE CULVERT FORM, BUILT OF SPECIAL ROLLED CARBON STEEL PLATE THOROUGHLY GALVANIZED

One complete Form is all any Township needs. This is why they cost less than any Form ever built. Culverts from 12 to 60 inches over the one Form. All parts interchangeable. We are the largest exclusive manufacturers of Complete Collapsible Steel Culvert Forms in the world.

GUARANTEED PLAN OF CULVERT BUILDING--

80 per cent. of the Concrete Culverts built by the Town Superintendents of New York State in the past two years, prove this. One Form guaranteed to do the work of six ordinary sheet-iron Culvert Forms.

WE HAVE NO COMPETITORS—We guarantee our Forms to do exactly what we claim or we don't want your money. Write for large catalog. Good live salesmen wanted in the Central and Western States to learn our selling-plan.

CONCRETE FORM COMPANY
(INCORPORATED)
SYRACUSE, N. Y.



LUTEN  DESIGN

Protected by forty cost-saving Luten patents. Seventeen suits won, with twenty-two decrees, enjoining thirty-five infringers. Twenty-two suits now pending. Designing engineers are never prosecuted under the Luten patents except when they oppose authorized Luten designs for their own infringing plans.

CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

WILLIAM SEAFERT, Editor and Publisher

OFFICE—1117 Schiller Building

Telephone, Randolph 934 Cable Address, "Seaferts" Chicago

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month, as hereafter our magazine will appear on the 5th of the following month.

Advertising Rates Sent on Application

JOHN F. WALDRON - - - - - Advertising Manager

CHICAGO, JANUARY, 1915

TWO CALIFORNIA EXPOSITIONS

Two California cities, San Francisco and San Diego are celebrating this year the world's greatest commercial achievement, the completion of the Panama Canal, by large International Expositions, whose object will be to illustrate the world's economic and artistic progress during the ten years in which the canal was built.

The Panama Canal, by affording a more direct waterway for lines of ocean travel, will promote the commerce of the entire world, and thus advance the welfare of every nation. New areas of productivity will develop, and new commercial exchanges will be established.

The opening of the canal therefore concerns all nations and, for this reason, these California World's Fairs will be of a more international character than any exposition heretofore. Thirty-one countries will be represented in the foreign section.

Owing to the mild climate these expositions will be open practically the whole year, that at San Francisco from February 20th until December 4th, while the San Diego Fair will open its doors on the first day of the year and will close only on the last day of December.

While every visitor will certainly be amply rewarded for a pilgrimage to these shrines of beauty in which in round figures a hundred million dollars are invested, the concrete engineer will find a special inducement for a visit to the Golden Gate city in the fact that he will see San Francisco rejuvenated after the great fire mainly by the aid of reinforced concrete construction which has taken the place of other methods of building more than anywhere else owing to its stability and fireproof qualities.

AMERICAN CONCRETE PIPE ASSOCIATION

The next Annual Convention of the American Concrete Pipe Association will be held in Chicago, February 15th and 16th, 1915. This will be during the Cement Show, thus enabling all those who come to the Association Convention to attend the Show as well.

Several addresses of unusual interest are being prepared for the program, detailed announcement of which will be made in due time.

CAUSES OF EFFLORESCENCE

A report on this subject was recently presented to the International Association for Testing Materials, by Prof. J. A. Van der Kloes Delft, Chairman of the Committee of Fifty appointed to investigate it. The conclusions were summarized as follows:

1. *Excess of Lime*—All that exudes from buildings in brickwork or concrete, and hardens on the surface into crusts and stalactites, is almost pure carbonate of lime. Extraction of lime takes place both with Portland cement mortar and lime mortar, which each separately as well as with mixtures of both, and also with trass mortar too rich in lime.

Lime is dissolved by water as hydrate of lime, and conveyed by it to the surface of buildings, where, during the evaporation of the water, lime absorbs carbonic acid from the atmosphere and forms with it carbonate of calcium. Therefore, special attention should be given to binding the lime in mortar and concrete by an excess of puzzolana.

2. *Efflorescence and "Wall-Cancer"*—Probably a connection—not yet definitely established—exists between the presence of an excess of lime in mortar and the formation of efflorescence and "wall-cancer" on the surface of buildings; yet lime itself often seems to have little or no share in the composition of such efflorescence.

3. *Corrosion of Stone and Bricks*—Building stone and bricks may be attacked:

(a) By products formed in the mortar. There are certain very soluble constituents of mortar, which, in intermittent periods of dryness and moisture, alternately crystallize out in the pores and on the surface of stone, and are dissolved again by rainwater. Scaling off (wall-cancer) caused by this is to be explained by osmosis (percolation through the accumulation between the strata).

(b) By constituents of the bricks themselves. Bricks may contain highly soluble matter, which have the same effect as those treated under (a).

(c) By constituents of the atmosphere. In the case of the trachyte from the Drachenfels, we see that the stone from the cathedral of Cologne contains 2.4 per cent, that from the quarry but 0.5 per cent of sulphuric acid.

Corrosion of natural stone by atmospheric sulphurous acid producing exactly the same effect as the products of mortar treated before, there is reason to express the opinion that the action is osmotic in this case also. There is also reason to put the question whether, in spite of the trifling solubility of lead-hydroxide in water, osmotic action may not likewise take place wherever joints in masonry are sealed with mortar lead.

IMPORTS OF CEMENT

The Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, state that imports of cement, by countries and by districts during October, 1914, were as follows:

Countries.	100 lbs.	
France		
Germany	36,360	\$13,756
United Kingdom.....	35	20
Other countries.....	993	458
Total.....	37,388	\$14,234

Districts.	100 lbs.	
Maine and New Hampshire.....	5	\$ 3
New York.....	35	20
Hawaii	988	455
San Francisco.....	36,360	13,756
Total.....	37,388	\$14,234

*Eighth
Annual*

CEMENT SHOW

*Coliseum,
Chicago,
February
10-17, 1915*

ENGINEERS, contractors, architects and builders will be offered every facility for the inspection and study of mixers, hoisting apparatus, aggregates, belting, forms, clamps, molds, crushers, engines, barrows, saws, sidewalk, curb and gutter forms, concrete paving machinery, Portland cement, cement products, sack balers, reinforcing tools and concrete handling equipment of all kinds.

Representative manufacturers in the concrete field will utilize 215 exhibition spaces. The CEMENT SHOW performs a real service to the worker in the field of concrete design or construction. Every visitor may gather invaluable ideas, become richer in knowledge and secure a strong grasp and better understanding of the problems of concrete.

Band Concerts Every Afternoon and Evening

Incidental conventions of the American Concrete Institute, American Concrete Pipe Association, National Builders Supply Association and the Illinois Lumber and Builders Supply Dealers' Association.



EIGHTH CHICAGO CEMENT SHOW.

February 10-17, 1915.

Poverty is largely a matter of mental attitude. Especially is this true in town and county construction where often a niggardly policy prevents real success and causes greater losses, due to inefficient operation with old and poor equipment, than the amount of necessary investment to obtain modern equipment and consequent lowered cost of work.

Especially is this so in concrete paving. In a certain large city in the Northwest, where the 1914 program included much concrete paving, the city engineer was handicapped for lack of funds, not by actual poverty so much as a policy which limited expenditures to labor and materials rather than investment in labor-saving machinery. The result was that over a mile of concrete paving was laid with a stationary mixer. At considerable labor cost, it was moved at intervals of 80 feet of pavement and both concrete and aggregates were wheeled from and to the mixer by labor, whose excess cost equalled more than one-third of the initial cost of a modern paver. Future years' programs will doubtless cover the same pavement in increasing quantities and should it not, the city would save the mixers cost many times over, if only for pavement foundations.

But this niggardly policy, this lack of appreciation of the economy of investing in equipment, good for many years of service, has caused the entire loss of goodly sums in excess labor which is not represented in additional street improvements but has been absorbed by the inefficiency of operation.

Many cities might claim this unenviable situation as their own. The city engineer may not be the one to blame. There may be no one man responsible. But education is needed to show that public improvements are of maximum value when built at least cost to the community and can only be done at least cost with adequate equipment.

The same is true of many lines of construction. Curb work may be so handicapped by lack of modern efficient form systems as to be laid only at greatly increased cost. The ingenuity of the local engineer's office in designing home-made equipment, because of the lack of funds, is not to be condemned. Such economy is creditable, but it represents an initial economy which is dearly paid for during the course of a year's construction.

These truths are brought out strongly to a careful student at the Cement Shows. The manufacturers are quick to sense the needs of the industry; to put forward devices for the cheapening of work; but these machines and materials are not to be had at a price as low as the older makeshifts. For every advance it is necessary to pay. But the economy of the whole operation is increased by a heavier investment and adherence to old practices is a pure waste, an inexcusable error.

While the road shows this year have been devoted, to a very large extent, to machinery and appliances used in concrete road and street construction, yet the Cement Show is the central market place of all concrete machinery and appliances. The road is a specialized problem of concrete construction, but it is taking such a large share of attention at the present time and the methods of operation are undergoing such great change that for a time road machinery must hold the center of the stage at the Cement Show, irrespective of the other opportunities for road men to inspect and buy.

But the Show is so big and all-embracing in its scope that the general building contractor will find his

field adequately covered. The small town contractor whose work is largely residence and store foundations and sidewalks will find equal inspiration in the exhibits, for methods are developing as fast, perhaps, for handling this class of construction as for the bigger and more ambitious work.

It is probable that before many years contracting will be practically synonymous with concreting, since the branch of construction will be successfully prosecuted without a full knowledge of concrete and a full equipment for its placing. This is true to such an extent at the present time that contractors who are not equipped to handle the concrete details of big contracts are becoming fewer. Thus engineers in any line are finding it increasingly necessary to know the fundamentals of concrete construction and to understand modern methods of operation. To these men the Cement Show offers a big field for study.

A tendency of modern times is to scrutinize more carefully all materials of construction and to subject materials, once received on faith, to analysis which will insure the highest uniformity. This careful scrutiny is being very widely applied today to aggregates. It would seem farcical to apply careful tests to cement, only to mix it with sand and gravel of unknown constitution and doubtful quality. Each year has seen at the Cement Show an increasing number of devices for washing and screening sand and gravel and the importance of this is being realized more and more each year.

Specifications are closing down so as to exclude many materials from concrete work which were once standard. The study of these devices at the Show will often indicate to producers and dealers in aggregates, ways of obtaining an increased price for a higher grade material. Ten cents a yard expended in washing sand may increase its selling price out of all proportion to the added cost. Perhaps some education will be needed to place these higher grade materials on the market, but engineering and contracting journals are laying emphasis on this in a way which must be productive of big changes in the immediate future. It behooves material men to study the problem and anticipate the demands of the engineering profession.

Coincident with the Eighth Chicago Cement Show will be the:—

American Concrete Institute.

National Builders' Supply Association.

Illinois Association of Municipal Contractors.

Illinois Lumber and Builders' Supply Dealers Ass'n.

American Concrete Pipe Association.

SAND-LIME BRICK

The Composite Brick Company, Plant City, Fla., declares that it has been one of the hardest fights to get sand-lime brick introduced in Florida in close competition with cheap clay brick coming in from Georgia, which has millions in reserve. They are pleased to state, however, that the future is very encouraging and at present their sales average 110,000 a week, with orders ahead for nearly 2,000,000 in sight. They are selling more now in comparison with the clay people than formerly. The Composite Brick Company succeeded in having the city building code changed to include high quality sand-lime brick which must be made from a ground mixture of lime and sand and must pass Government tests. By this method they expect to sell their product to all builders who made use of a poor quality of clay brick heretofore.

An Analysis of The Benefits of Electric Drive in Cement mills

By Thos. H. Arnold

In the consideration of this subject the rapid growth of the cement industry, and the magnitude of the power consumption, should be thoroughly comprehended. According to the statistics of the United States Geological Survey there were produced in the

posit extends in a practically straight line from Reading to Martin's Creek with a detached outcrop southeast of Phillipsburg, N. J., upon which three plants are operating. This district, in 1913, produced 27,079,000 barrels or a trifle less than 30% of the total for the

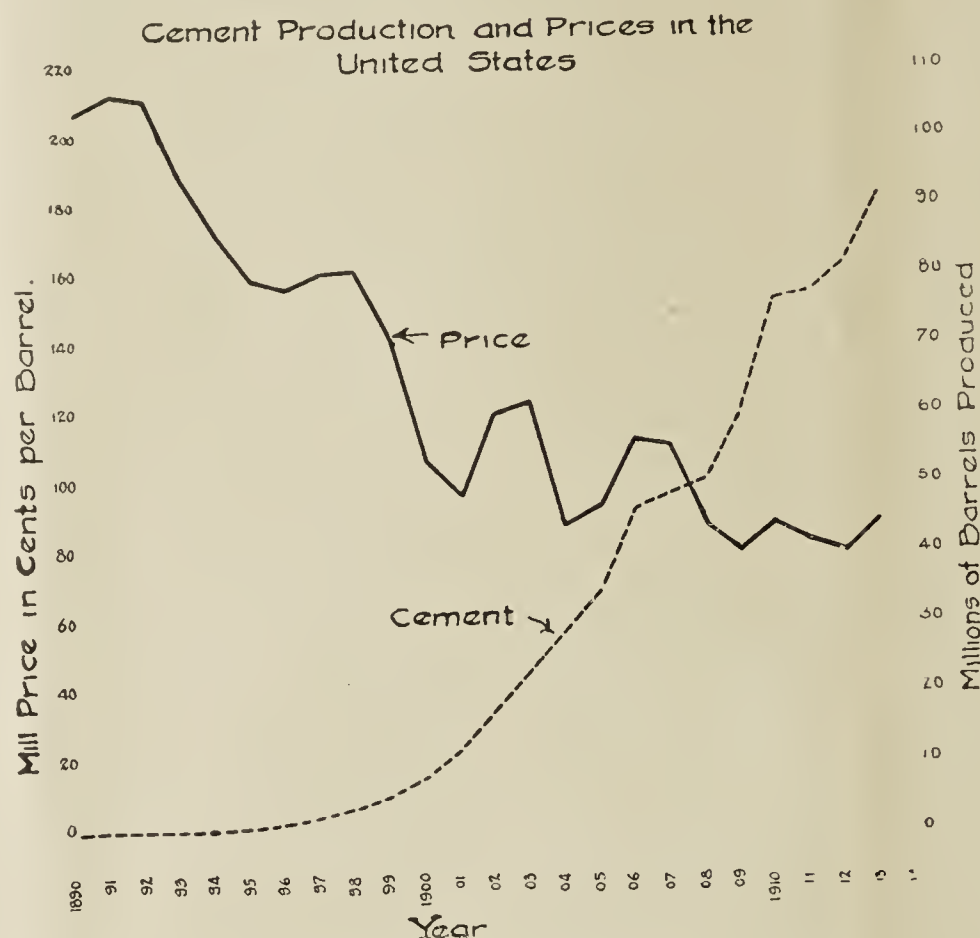


Fig. 1. Chart of Production and Average Mill Price for Cement Manufactured in United States.

United States in the year 1913, 92,097,131 barrels of cement. A fair average of power consumption for the entire country would be 18 K. W. H. per barrel. Thus the cement output for last year represents the use of approximately 1,658,000,000 K. W. H. Of course, much of this is generated by the cement companies them-

country as a whole. On the basis of 18 K. W. H. per barrel, this represents a power consumption of approximately 487,500,000 K. W. H. The greater portion of this power was used by steam engines either direct connected to line shafts or transmitted by belt or rope

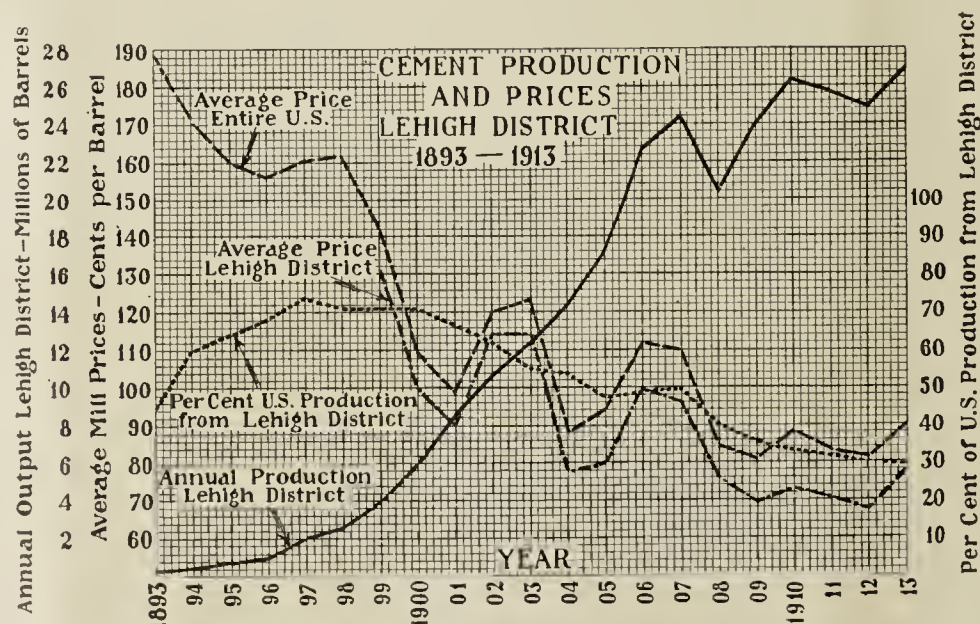


Fig. 2. Chart of Production and Average Mill Cost of Cement Manufactured in the Lehigh District.

selves and a large portion does not appear in the form of electric power.

The Lehigh Cement District comprises a series of mills along the outcrop of a deposit of Argillaceous limestone which has very nearly the correct chemical composition as it comes from the quarry. This de-

drive to line shafts from which the individual machines were belted.

With a total power consumption of this magnitude, the possibilities for effecting economies are quite vital. Power economies in this industry will have a much wider effect on the ultimate cost than in many other

processes in which the power system has been worked out in very fine details. Very few manufactured products have a higher proportion of their total cost represented by the cost for power as does cement.

The ratio of the power to the total cost will vary widely with the type of machinery and design of the plant. The character of the materials, the labor cost, and transportation charges will also have their effect on shifting the ratio of the various charges. However,

ing the spring and summer. For this they offer a secondary rate, usually somewhat lower than the regular rates. To induce a cement company to purchase power a very low rate must be offered as the majority of plants are located at a point where fuel is comparatively cheap and with the large units in use and high load factor, power can usually be made at a cost comparing favorably with the average Central Station of similar size.

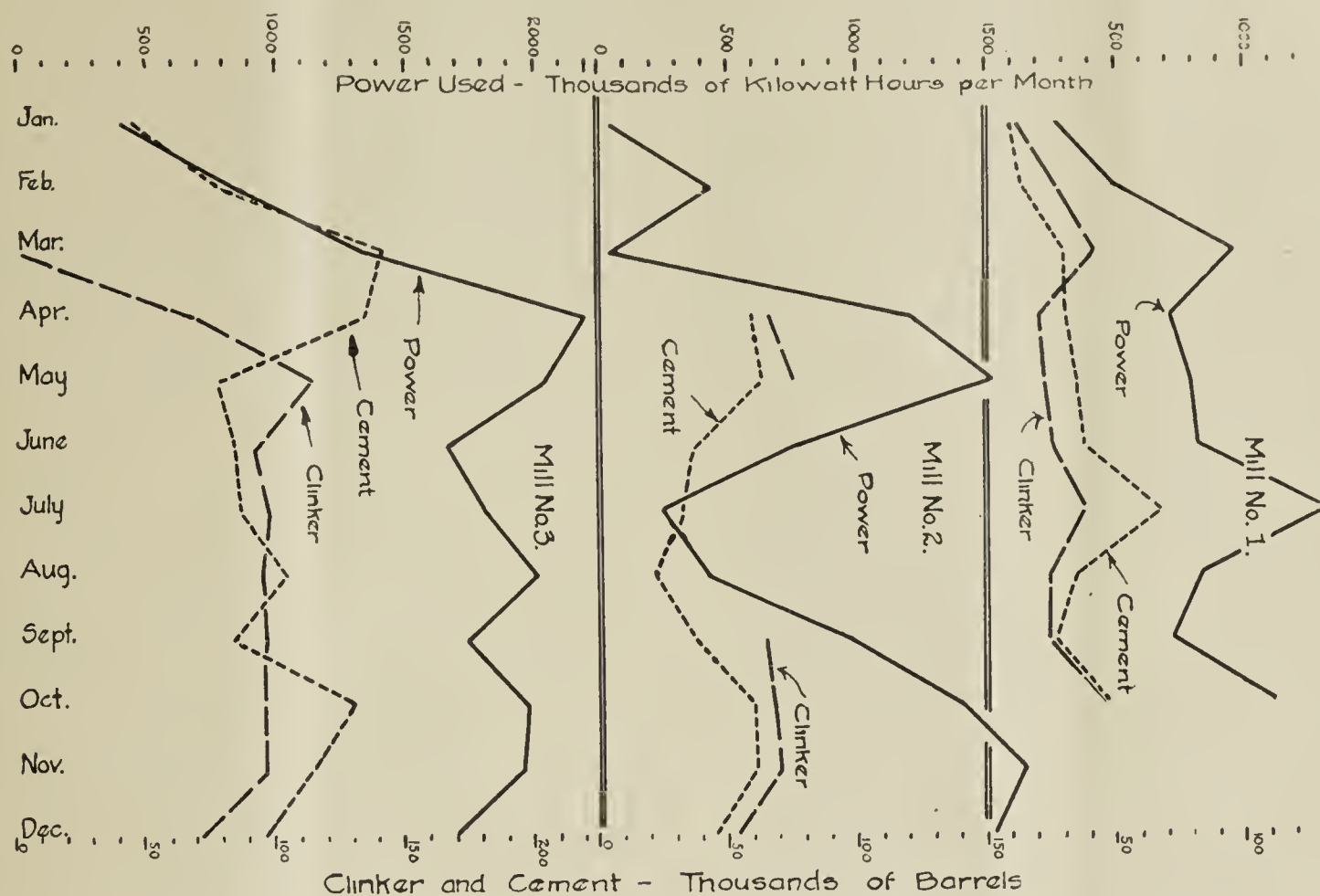


Fig. 3. Chart of Typical Power Consumption and Cement Production in Electrically Driven Cement Plant.

a fair average of a modern mill may be expressed as follows:

Manufacturing labor	21%
Maintenance and repair labor.....	7%
Supplies	15%
Coal	27%
Office and miscellaneous charges.....	4%
Power	26%
	100%

Thus the power cost will usually represent from 20 to 40% of the total cost of the finished product, thus power savings will markedly reduce the total manufacturing cost.

The daily load factor is usually very good in a plant of this kind as the mill is run full blast for twenty-four hours per day and seven days a week for about nine months. The winter months will probably average less than 50% operation. Thus the yearly load factor will be in the neighborhood of 60%. With careful management and extra machine capacity this can probably be increased to 80% and by maintaining a steady output in the mill with a large seasonal storage, it would be possible to reach 90%. The season at which the heavy demand for power occurs would suggest two possible combinations upon which a power company could base a low rate for this class of load. A large city lighting load reaches large peaks in the winter and drops off in the summer. The cement plant demand is the reverse and reaches its heaviest demand in July and August. Many hydro-electric plants have surplus water which could be turned into power dur-

In the application of electric drive to cement mills, certain conditions must be recognized which are peculiar to this industry. The greater part of the load is in use nearly the whole of the twenty-four hours. The quarry crushing and packing departments are customarily operated for only ten hours. The tendency in some districts has been to run full blast for nine or ten months and shut down partly or entirely for two or three. This gives a rather poor yearly load factor, in spite of the good monthly load factor for the greater part of the year. On a process of this kind,



Fig. 4. Ball Mill with Individual Motor Drive.

where the power cost enters so largely into the total cost, the yearly load factor should have considerable attention. By running the plant to secure a uniform load throughout the year, some changes will be necessary in the plant. The matter of storages for equalizing the flow of material through the mill will be more necessary. The power charge per K. W. H., with the present rates, will vary with the number of kilowatt hours used in proportion to the maximum demand. Thus to keep the cost per kilowatt hour down we must run with the least possible maximum demand and the largest number of kilowatt hours. This means that as the crushing and packing departments are shut

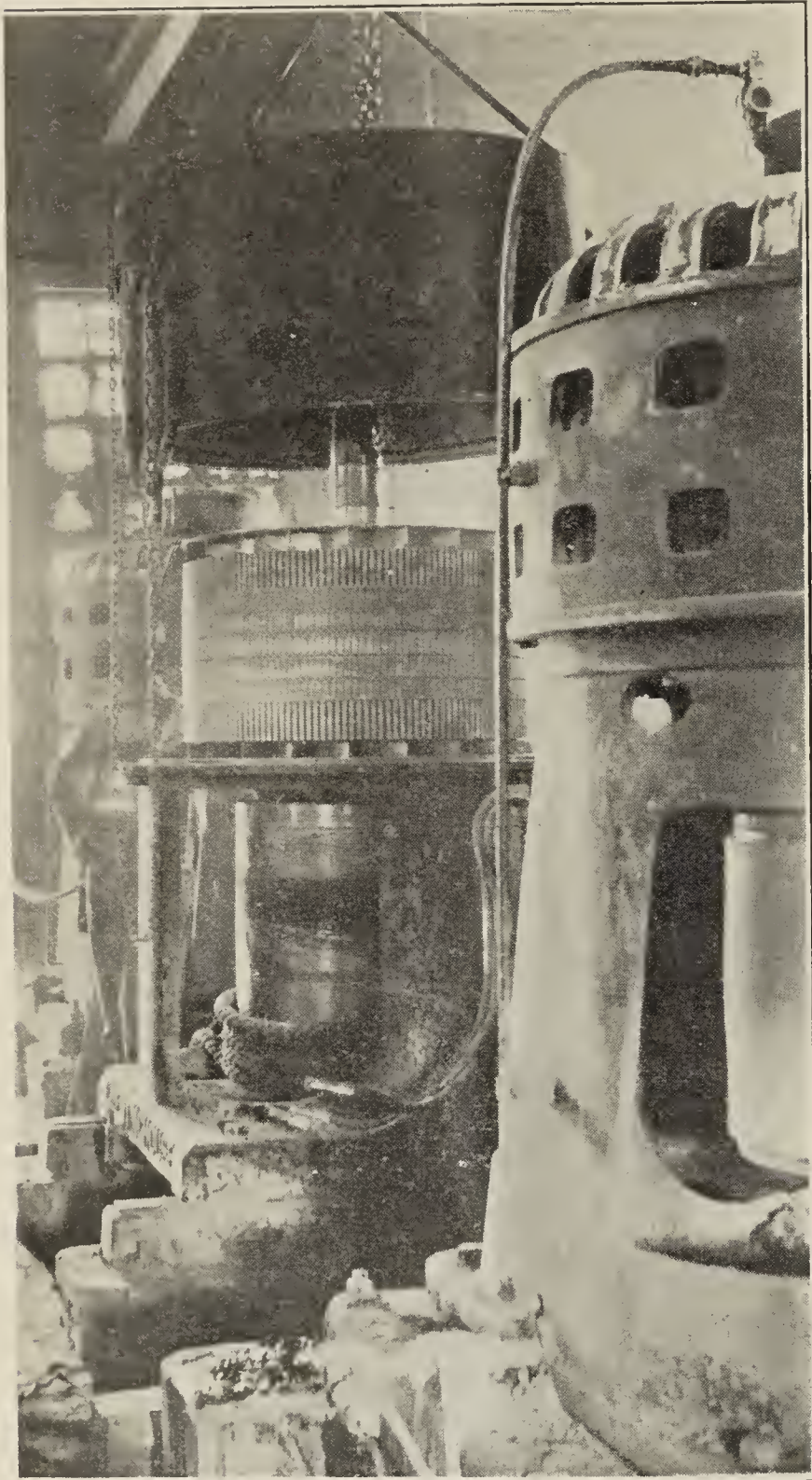


Fig 5. Belted Type of Vertical Motor Showing General Construction.

down at night other load in the shape of extra mills in the grinding departments should be thrown on to keep the power demand at the same point; also extra mills should be provided for use when it is necessary to cut one out for repairs. In most cases with existing equipment this will be taken care of by the extra output available with the electric drive and actually a smaller number of mills will be required for the present output. This method of running for a steady power load will be found to possess numerous advantages outside the saving in the power cost.

It will be noted that in the operation charts of the three mills shown no attempt was made to keep the

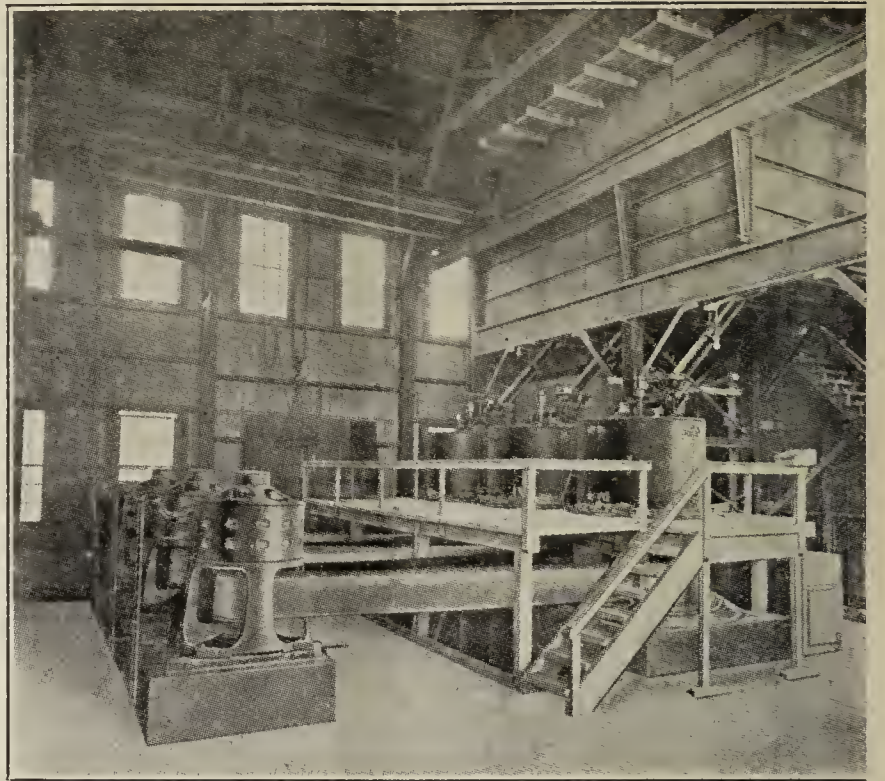


Fig. 6. Vertical Motor Installation Driving Fuller Mills.

production and power consumption uniform. Where the power charge is made upon the basis of a fixed charge per kilowatt of maximum demand with an additional kilowatt hour charge, the result in the case of Mill 2 would result in a very high charge per kilowatt hour. This extra cost for power would justify the interest on a large amount of material carried in storage. Operation in this manner must necessarily cause wide fluctuations in the manufacturing costs. During such prolonged shut downs on the raw side and the quarry, the working force would be badly disrupted and in many localities difficulty would be encountered in obtaining a new force when operations were resumed.

The inter-dependence of the machinery must not be lost sight of in the general plant layout. The elevating and conveying machinery is the very life of the plant and should be made as absolutely reliable as possible. Unless the conveyors are installed in duplicate, a shut down for any cause means a shut down of the whole section of the mill ahead of it. In this way a properly designed motor drive will eliminate many causes for shut down due to shafting, belting and friction clutch troubles.



Fig. 7. Vertical Motor Installation Driving Griffin Mills.

Starting loads are unusually severe. The machinery is heavy and more especially the ball and tube mills require very large starting torques in proportion to the running load. For this service the wound rotor type of motor gives excellent satisfaction. The Fuller, Griffin, Kent, and other mills do not require such heavy torque unless they are shut down with a load in them. Of course, theoretically, this should not be done, but practically in the operation of the mill these things are done and have to be taken care of. The motor is expected to pull out a choked elevator or conveyor, and if it will not do so it is considered the fault of the motor itself. These conditions have resulted in applying many features of special design to the motors for this service. Some of these features have been incorporated to better the design of standard lines of motors.

As in other industries new machinery has been developed for carrying out special features. Mills of the Fuller, Emerick, Griffin, and Bradley types with a vertical shaft have called into use a vertical type of belted motor in fairly large units. These are used in sizes from 50 H. P. to 200 H. P. With the application of pulverized fuel in the steel and copper industries, these mills have a much wider application in grinding coal. Thus the special machine of a few years ago becomes the standard machine of today.

The use of the magnetic pulley for separating iron from the coal or rock before it passes to the grinding machinery is becoming more common as the saving in mill repairs due to this machine becomes more widely known. Electricity is used to a large extent for operating scales and counters in weighing the material in transit. Hoisting and hauling problems and the application of electricity to drilling and rock shovels have been tried out in the mining field wherever large quantities of material are handled. The special features of the cement industry in this line are very similar and no more severe than have been met in the mines.

Recently the value of the storages in the various stages throughout the plant is being appreciated. Several types of machinery have been tried for this service. In the earlier storages the capacity was small and the belt conveyor, the bucket elevator and conveyor were ample. It soon became apparent that the maintenance cost was very large, especially on the clinker storage. The Monorail hoist and high speed electric traveling crane then made their appearance. These are capable of handling large tonnages in a short time at a very low cost. However, special precautions must be taken to protect the moving parts from the abrasive dust.

In the smaller plants probably a Monorail system with a grab bucket of sufficient size that it could tend the rock, coal, and clinker storage would prove ideal. In the larger plants the individual cranes for each storage would prove more satisfactory.

The condition of dust and dirt are peculiar. Electrical apparatus is designed to operate under comparatively clean conditions. When dry, cement dust is a rather good insulator, but when wet it absorbs moisture like a sponge. For this reason there is very little to commend the practice of installing overhead transmission lines around plants of this nature. The use of a pressure above 600 volt is not usually considered advisable in industrial plants unless special precautions are taken for protection. This means that with the heavy power consumption, large conductors must be installed. The cost of the structures necessary to support these conductors will approach very closely the cost of an underground system and will not be nearly as satisfactory. The strains are enormous and as the coating of cement gets thicker the ordinary sleet



Fig. 8. Storage Tended by Monorail System.

and wind calculations are exceeded. Frequently No. 8 weatherproof wire will build up two inches in diameter and stretch out until it breaks from the weight of the accumulation. Large cables must be periodically cleaned of the accumulation or the structures supporting them will be damaged. The leakage in wet weather will amount to a very considerable item. This is more noticeable as the voltage is increased. At one plant a 2,300 volt line ran from the power plant back of the mill and over the hill. This line was exposed for about seven poles to the action of the cement dust. After this line was in place about two years, trouble was encountered. In wet weather the leakage could be observed at night and in about six months the pins were digested and had to be replaced. The current frequently flashed over and blew 40 Amp. fuses at the power plant when there was no load on the line. In the Lehigh district this trouble has been encountered on power lines located two and three miles from the nearest mill.

Cement Output in an Electrically Driven Mill.

Most of our switching and circuit breaker apparatus is not designed to meet the severe dust conditions. Frequently the abrasive dust works into the movable parts and prevents switches and circuit breakers from

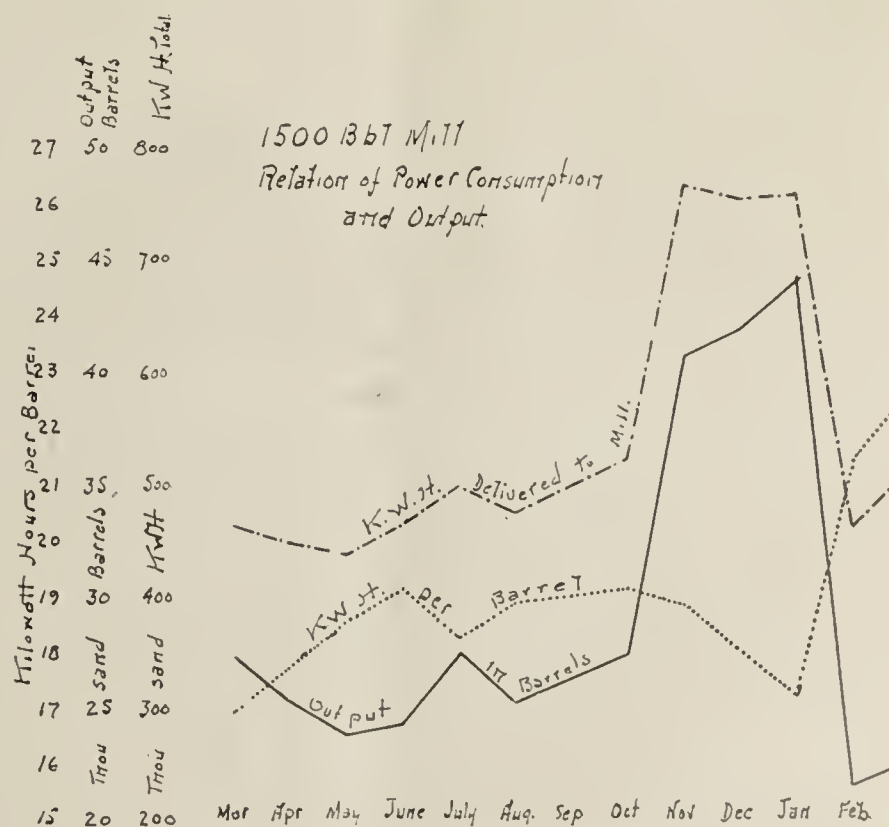


Fig. 9. Chart Showing Relation of Power Consumption and

operating properly. In some cases they have to be dismantled before they can be opened or closed. This dust is a very good heat insulator and as the ability of a motor to carry its load depends largely upon its ability to get rid of the heat generated, unless this dust is frequently removed, trouble on this score may be expected. The most popular method of taking care of this trouble is to pipe compressed air from the quarry compressor around the plant, and to use a hose for the removal of the dust. This distributes the dust in a great cloud throughout the building and results in a general exodus of the operating crew till the air has cleared. A better method would be to take all possible precautions to prevent this dust from escaping.

Unless carefully watched the dust will accumulate in the bearings and in many cases the dust around the outside of the bearing will siphon off the oil and leave the well dry. The remedy for this is, of course, obvious. With ring oiled bearings provided with proper dust guards the trouble from cutting of the bearings is not so troublesome as might be expected as the stream of oil constantly washes away the abrasive matter. Pulleys and rotors are likely to get accumulations of dust around the circumference. When they are shut down this will all fall to one side and if not cleaned out is likely to throw them badly out of balance.

Unless very liberally designed and well-fitted, clamp contacts, enclosed fuses, knife switches, and similar apparatus will give trouble. This dust will gradually creep in between the surfaces and form a poor contact. With the resulting heating, conditions are likely to get worse instead of better unless proper remedies are applied. Some forms of movable contacts when left standing open, especially in the presence of oil, are coated with an insulating covering which will cause arcing and burning when closed. Meters are usually specified to be "dust proof." However, with this impalpable powder we find that nothing but hermetically sealing will give such a result. The meters are more or less delicate and in some cases the dust accumulation inside them will seriously affect the readings. In case the glass is cracked or the case damaged, the meter should be repaired as soon as possible.

It is undoubtedly true that a much larger percentage of costly mistakes have been made from unfortunately chosen electrical machinery than in any other part of the mechanical equipment of cement plants. This has resulted from the fact that the electrical equipment was considered a minor factor and hardly de-

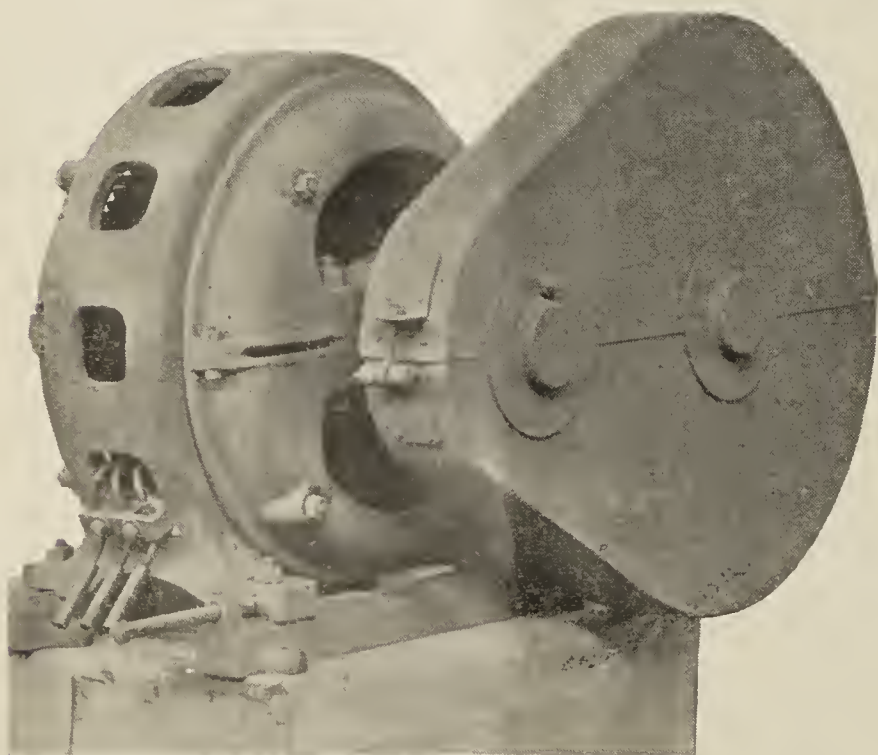
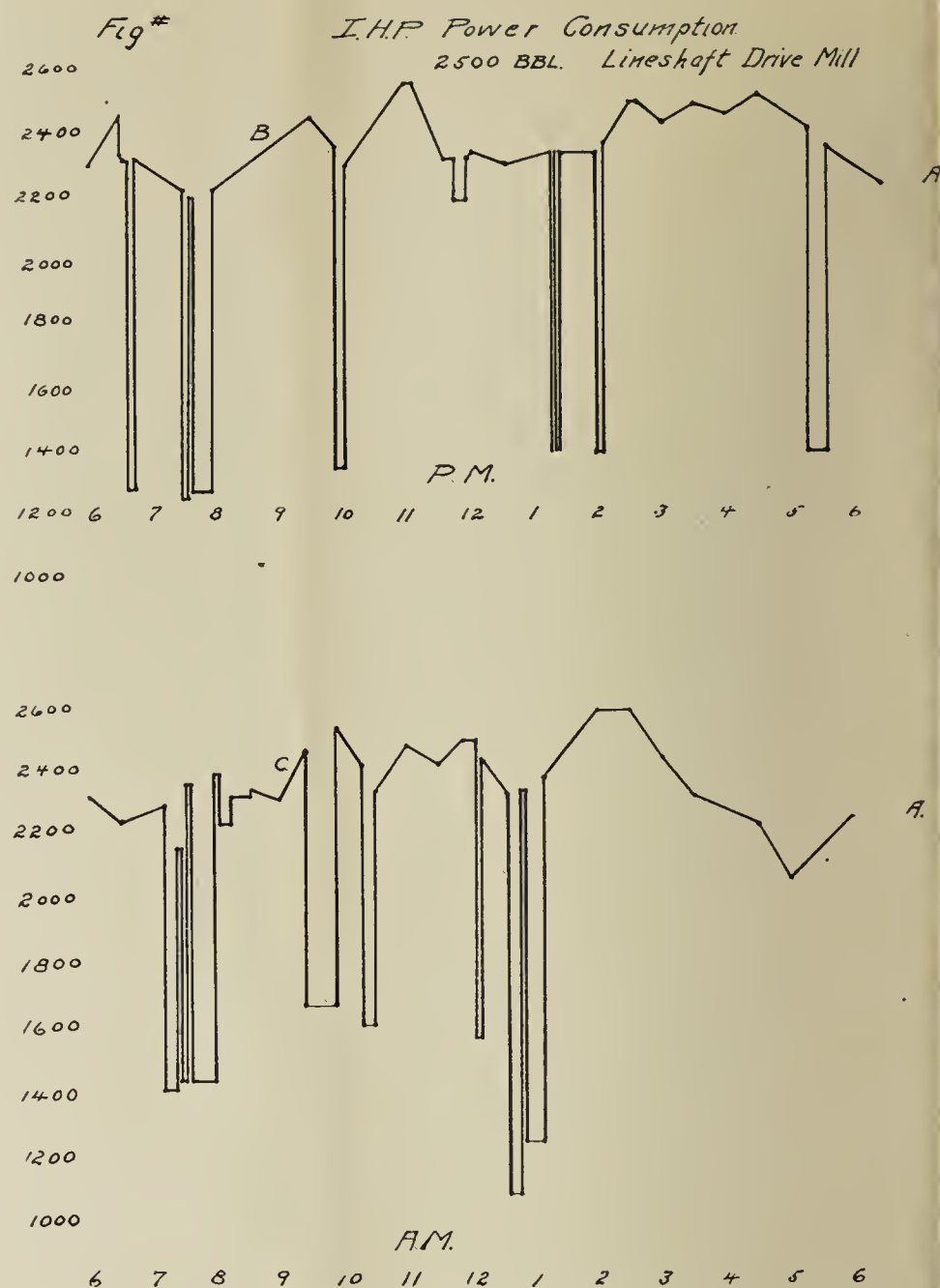


Fig. 10. Back Geared Motor with Enclosed Gears.



served serious attention, thus the machinery was not in all cases carefully selected to fit the requirements. These troubles may be largely overcome by a careful consideration of the detailed requirements of the individual plant before and during the drawing up of the plans. Each plant should have a careful analysis made by an engineer thoroughly conversant with the needs of the machinery. In this way both construction and maintenance costs will be kept at a minimum due to the thorough method in which all points were considered in the original planning and erection of the machinery.

With a plant properly designed we may expect many advantages with the electric drive which do not exist in the steam driven plants. As a rule the matter is considered very little deeper than the saving in the cost of power itself. That there will be a real saving in power cannot be denied. In a number of cases the fact that several electric driven plants have shown a high horse-power consumption per barrel in comparison with some of the steam driven ones has been widely commented upon. But in these comparisons we have largely lost sight of many elements which have a very considerable bearing on the power consumption. The electric driven plants have mostly been in the West where the material is vastly different and finer grinding is more prevalent. The power consumption of some of the electric driven mills in the East have been given so low that the figures have been discredited and yet figures very little higher on steam driven equipment using similar materials are pointed out as reliable results which may be accomplished with an economic steam plant.

The elimination of the transmission machinery, large clutches, bearings, heavy pulleys, shafting, and intricate rope and belt drives, are bound to effect more of a power saving than will be lost in the electrical machinery necessary to replace it. The efficiency at partial load will be very much better. In this connection the possibility of arranging the drives in such a way as to be able to utilize the power to the best advantage will be given more attention, and as the use of purchased power becomes more common, the advantage of a good yearly load factor will be better understood. By operating in this manner, the working forces will be kept together and new crews will not have to be broken in as is usual after a shut down. The overhead charges are spread out over a more uniform production and thus the variations in production costs are largely reduced.

In a steam driven mill the boiler plant is usually located in some central location unless the plant is large enough to have several boiler houses. In this case, we have the option of running some long steam lines to supply engines at the far points of the mill or we can run long rope drives. Either method of installation is costly from a construction standpoint and wasteful and expensive on the operating side. These losses are frequently overlooked in running power tests on the steam machinery. These tests are usually made by indicating the large engines, thus omitting power used for pumping at detached points.

Repairs are reduced to a minimum with electric drive. The modern alternating current motor is probably less subject to breakdown under normal running conditions than any other piece of transmission machinery we have at our disposal at the present time. What repairs are necessary are easily made and inexpensive. The shut down need not be long and in the worst cases the entire replacement of a motor is neither a lengthy nor costly operation. Where several similar motors are required a spare unit will frequently save its cost in shortening the shut downs by replacing the machine in need of repairs and enabling the repairs to be made at a more convenient time. The extra capital tied up need not be large if due care has been expended in a careful standardization of the equipment. That this can be done is readily proved. In an individually driven plant with some seventy-five motors, of which some were specially designed for the purpose, the writer was able to keep within ten sizes of alternating current motors and two sizes of direct current. The advantage in thus keeping to a few standards is quite apparent from an operating standpoint and will soon offset any saving in original cost, in the simplification of the repair parts necessary and the small time loss of making changes. This will be more apparent, of course, under Western conditions where an express order means from ten to thirty days and freight is usually figured at two or three months. However, even a matter of a day is important when machinery is expected to grind away as nearly twenty-four hours as possible.

Belts and ropes for driving are short lived at best in cement mills. In a great many cases a year's run is exceptional, even on some of the heavy drives. Leather belting is increasing rapidly in price and in a few years its use will be almost prohibitive under these conditions. Various forms of cotton belting have been devised and some of them seem to stand up to better advantage than leather when cost and life are considered. The total belting expense for a year on some of the plants would go a long way toward paying for the electrical motors necessary to drive the machinery with a system of individual motors.

The elevators and conveyors call for many small

units of slow-moving power supply at detached points. To meet this demand various forms of geared motors have been tried, some of which were not successful. In the earlier experiments the gears were run open and were exposed to the rapid collection of dust and dirt which caused a short life and high maintenance cost. In many of the earlier types the motor and the shaft were on separate foundations and were apt to work out of line which added to the trouble.

From these failures have been built the sturdy back-geared motor with the cased gears running in an oil bath. This unit requires a minimum of attention, has a long gear life and will have less cause for shut down than a countershaft belt drive. From the safety standpoint very little remains to be desired. In the out of the way places, in which these motors must be placed, the footing is apt to be poor and open shafting and belting is a constant source of danger. With all moving parts cased as shown a man could fall all over this motor with nothing but bruises for his carelessness. When the cost is considered the saving by putting a countershaft and pulleys in place of the back gear will usually be lost in belt maintenance in the first year of operation.

Heavy shafting, clutches, and pulleys are expensive to maintain. The expense is doubly felt because it is necessary to shut down large sections of the mill in order to make repairs. The other machinery remaining non-productive while the damaged parts are being replaced. In comparison the repairs to electric machinery are much less frequent and the expense is almost negligible. The defect of interference with the operation of large sections of other machinery does not exist. The quantity of oil and grease which is required with the line shaft drive is greatly reduced with motor drive. A higher grade of oil is used but it lasts much longer so that the total cost will be but a fraction of that previously required. A great saving may be expected from the fact that the depreciation on electric machinery under these conditions is much less than on transmission machinery with the line shaft drive.

A much larger output may be expected from the existing machinery with individual motor drive. A number of causes will contribute toward this and we will proceed to take them up in detail. Probably the greatest of these causes will be the greater percentage of mill hours run due to the additional flexibility in operation. A mill may be cut out for repairs or general repairs may be made on the system without interfering with the running of other units. Very few plants with engine drive can show a long run on any department without a shut down of the engines to repair some portion of the transmission machinery. These shut downs may not be of long duration, but they seriously affect the mill hours run. If we have, say twenty grinding machines belted from a line shaft and we shut down for one hour, we lose the equivalent of twenty hours on one machine. The actual time shut down frequently does not represent all the time lost by the mills, as some time is usually required for cleaning the mills of feed and in getting the feed running full again. Where several short shut downs occur during the day they will cause a very serious interference with the output.

A considerable increase in output will be noticed, due to the steady speed obtained by the elimination of belt slip. A careful test will ordinarily reveal the fact that with a belt driven plant it is almost impossible to maintain the speed on the machines at the most efficient point throughout the entire mill. The correction of this feature will, as a general rule, increase the output from five to fifteen per cent.

The ability to study the exact power and output conditions in each machine will lead to a further investigation of why the power and output of some of the mills seem to vary. The point of maximum economy in a mill is thus easily determined and maintained.

The introduction of individual ammeters on the motor control panels will enable the operators to hold the mill at its best operating point more readily than by judging as to the feed. By watching the ammeters carefully, defects in the machine are readily noticed and the machine may frequently be cut out in time to avoid serious damage. This method for actually measuring the work done by the machine instead of guess-

When changes are contemplated in the existing machinery, the line shaft must be considered first, last, and all the time. Motors may be installed practically anywhere and in any position. The first consideration is the requirement of the grinding machinery. The floor space may be used to better advantage and less complications are involved in alterations and additions.

The increased importance of the trend of legislation toward compensation of workmen for injuries should not be overlooked. While this matter may not at present have much effect in some localities no one can predict how soon it will be advanced or how far it will be carried. In some States these matters have to

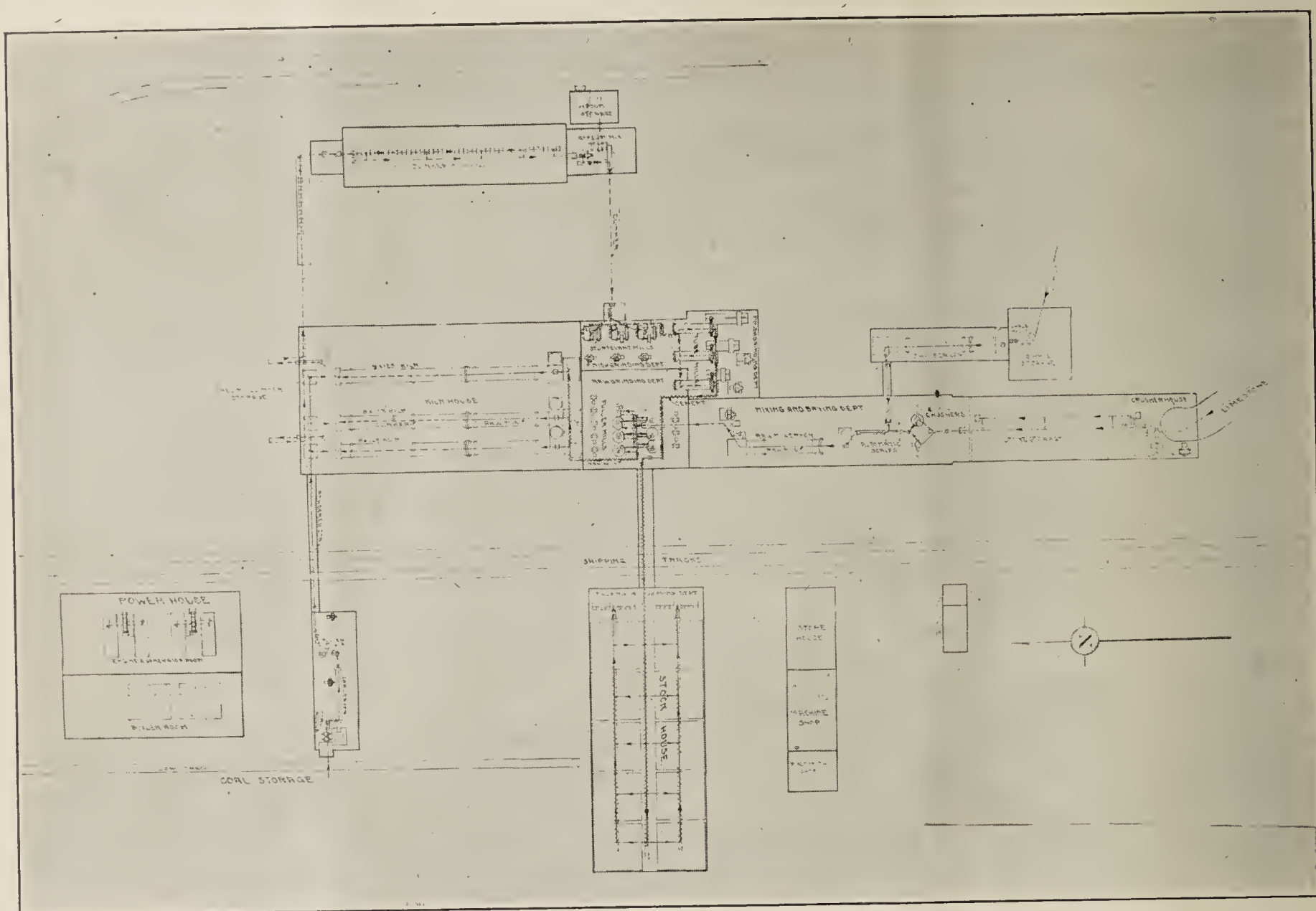


Fig. 12. Plan of a Cement Mill Showing the Adaptability for Making Additions to the Plant.

ing at it has been known to increase the output by five per cent.

The motor drive also introduces greater facilities for starting, stopping, and obtaining changes in speed. As a rule, with motor drive the change of speed involves only a change in a rather small inexpensive pulley or gear. Where several different speeds are to be used the variable speed motor offers a much more convenient method than any mechanical device. The upkeep costs on the various mechanical devices of this nature are quite large. In operating the kilns, a more uniformly burned clinker and a larger output can be secured, with a variation in the speed of rotation to suit the material inside the kiln. The reason being that the heat conditions can be regulated with a greater nicety by retarding or accelerating the speed at which the material advances against the flame than in trying to regulate the flame itself. A combination of both methods should give the best results.

be carefully considered, on account of the numerous damage suits, and the legal and contingency account may be several cents per barrel. The omission of the line shaft, belts, and clutches, goes a long way toward reducing the causes of accident.

The power house may be placed away from the dust of the mill and thus the machinery kept in better shape. The capital outlay for power plant may be considerably decreased by the use of steam turbine equipment. The opportunity to eliminate the power plant entirely should not be neglected. The power plant is almost always a rather bad point. It frequently introduces difficulties of its own entirely foreign to the cement industry. Purchased power will usually result in a considerable saving and eliminates one source of worry for the superintendent. He will thus be able to devote his time and energy more closely to mill to produce a maximum amount of cement at a minimum of total cost.



Fig. 13. Steam Turbine Power Station for a Cement Plant.

A very good example of the advantages to be obtained by the proper selection of the electrical machinery will be shown by analyzing a modern mill. This mill is located in the West and due to the quality of materials and other local conditions the arrangement is considerably different than would be the case in a more favored district.

In the general layout of the plant, the topographical restrictions did not present serious difficulties, although they could probably have done so with a purely steam drive. Concrete was used as largely as possible in the construction of the plant. All buildings, bins, and even the roofs were made of this material, and it was even carried to the extent of laying concrete walkways between the buildings. The wisdom of this course will be at once apparent from an advertising standpoint as well as utility. The construction cost was somewhat high, but the maintenance cost is practically nothing.

The center line between two railroad tracks through the plant form the datum line from which the buildings were laid out. Each department was housed in a separate building and all were planned for an ultimate enlargement to take care of five 8'x150' kilns. The flow of the material through the plant is direct from one process to another with due storages to take care of fluctuations and no crossings or interference.

Power is transmitted through underground cables from the power plant which is located away from the

dust and dirt of the mill. The power plant is an instance of the saving in investment and operating cost to be obtained from the use of the steam turbine and electric drive. Two turbines of 750 K. W. capacity furnish the power, thus giving economical operation when the mill is cut to half capacity. In this case very poor water was to be had for boiler feed. In fact 26 grains of total solid per gallon was about as good as could be expected. As the impurities were partly in suspension a water treating plant was installed which removed about fifty per cent of the total solid. The remainder was sodium chloride, sodium sulphate and calcium chloride and sulphate, making their removal rather difficult. The power plant thus offered a great many difficulties of an entirely foreign nature to the manufacture of cement and this company would gladly have purchased power had any such been available. Frequent trouble was encountered from foaming in the boilers and numerous slugs of water went through the turbines, sometimes seriously interfering with their operation. On the whole the turbines stood up under this kind of treatment rather better than could be expected of reciprocating engines.

The crushing department was rather simply arranged. The material in hand loading sizes was brought from the quarry in two-yard narrow gauge cars and dumped into a pair of No. 5 Gates' crushers and elevated to a pair of 24"x36" Buchanan rolls, bringing the material to half-inch size. From the rolls it is carried to the crushed rock bins and was sampled on going into the bins. From these the material was mixed and weighed into the blending bins. The raw mix was finally made from the blending bins and passed through the drier to the Fuller mill feed bins in the raw grinding department.

The raw grinding department consisted of eight 42" Fuller mills, each belted from its individual 75 H. P. vertical motor. The installation was very compact and quite efficient in every way. The mills were placed four in a row, all feeding into a conveyor between the rows of mills, thus utilizing a minimum of space and a short conveyor. Each mill is a unit in itself and any number can be out of service without interfering in any way with any of the others. The belting is cut to a minimum and no heavy line shaft transmission machinery is necessary. Repairs are slight and a high percentage of mill hours is attained.

The material, from the time it arrives in the kiln feed bins, is entirely under the control of the burner without necessitating his leaving the burning floor. Variable speed motors are placed on the raw feed of



Fig. 14. General View of Plant.

each kiln, on the kiln itself and on the two coal feed screws of each kiln. The controllers for these motors are arranged in a convenient manner at the front of each hood along with the auto starter for the rotary cooler. The fan motors are on this same floor. The

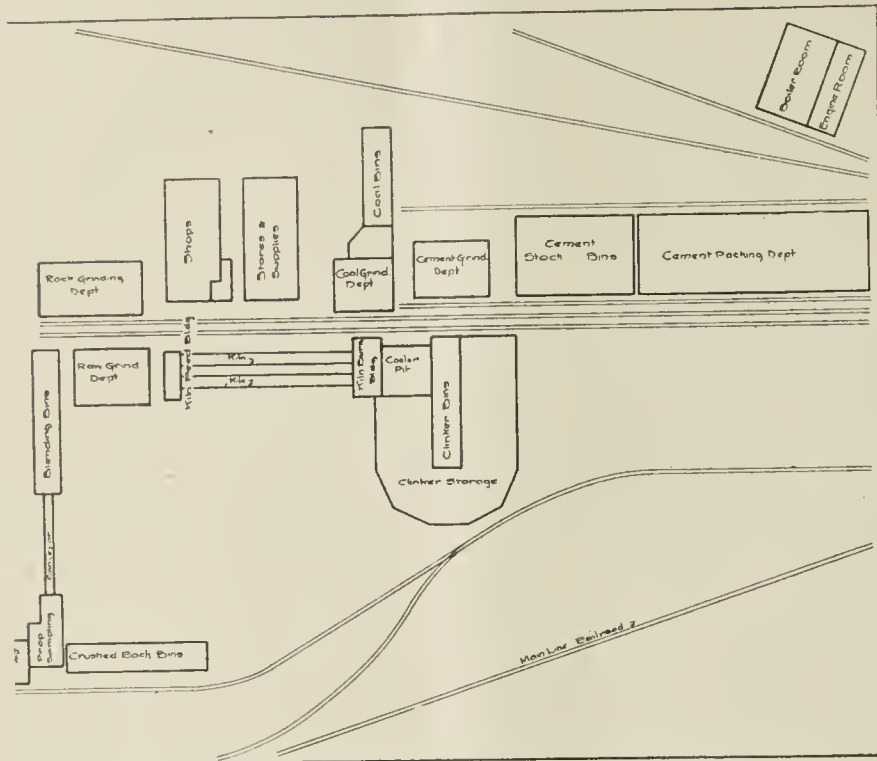


Fig. 15. General View of an Electrically Driven Plant.

clinker passes from the kilns through the rotary coolers and is elevated to a storage of about 80,000 barrels capacity.

A clinker grinding department is very similar to the raw grinding. A set of 24x36 Buchanan rolls, operated by 30 H. P. motor, crush the clinker to half-inch size. The gypsum is introduced at this point. Both clinker and gypsum are weighed on automatic scales. Quarry run gypsum is used. This is reduced in a Jeffrey hammer mill belted to a 20 H. P. motor. The large pieces apparently present no difficulty and the power consumption rarely goes beyond 25 H. P. for momentary peaks and more frequently it is in the neighborhood of 10 H. P. From the rolls the clinker is elevated to the bins. The grinding equipment consists in six 42" and two 54" Fuller mills. The 42" are belted direct to 90 H. P. and the 54" to 150 H. P. vertical motors.

In general all elevators, pivot bucket carriers, conveyors, etc., are belted or geared to individual motors. The lighting is carried entirely separate from the power mains. A lighting cable being run to central transformer stations and 220 V 3 wire or 110 V 2 wire mains run out as the case may be. Probably ninety per cent of the wiring is in conduit. While the first cost of this class of work is somewhat high, it may be said that the small portions of exposed wiring caused more trouble than all that enclosed in the conduit. The cost for maintenance and repairs, including mill power plant never becomes a serious factor in the cost per barrel. This was, of course, under conditions of rather high labor cost and where the freight sometimes equals the factory cost of the parts. It also included the greater part of the services of an electrical engineer whose services would not be considered necessary in a mill of this size in the East.

A large amount of experimental work was carried on with a view of improving the process and cutting the cost. In work of this nature the results are much more satisfactory as the electric power enables accurate records of power consumption to be made. The cost of the experiments are much less on account of the small cost of the transmission equipment and the fact that even if the experiment was not successful

the equipment used was largely standard and could be used in other places.

The percentage of mill hours was high, although more attention was paid to load factor at the power plant than to mill hours. In fact, the power plant was not sufficient to pull the surplus mill machinery if it should all be thrown upon it. As the equipment was shut down in one department the power was taken up in another.

A large factor in this plant was the safeguarding the men. The laws of this State are such that corporations are very subject to damage suits in case any workmen are injured. We all know that many more of the legislatures are taking up these matters and no one can say how far it will be carried. In some cases the damage suits run several cents per barrel on the entire year's output. This is a case where an ounce of prevention is worth several pounds of cure. The electric drive eliminates largely the line shafts, belting, clutches, etc., which are usually the cause of many accidents in these plants. By making more compact units, railings may readily be placed around the moving parts. One large advantage is that where electric drive is used the engineers are very apt to make frequent tests. This brings them frequently into portions of the mill which otherwise are not apt to get much attention from the high-class talent of the plant. Thus things are observed and remedied which otherwise would be left to the repair gang's good mercies.

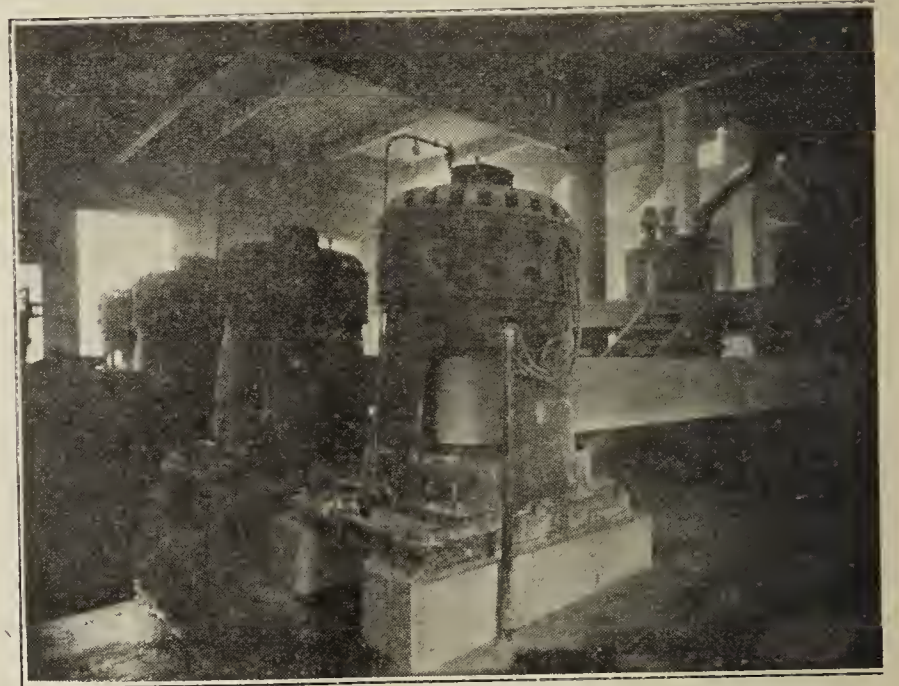


Fig. 16. Fuller Mill Installation Driven with Vertical Motor.

At this point, I wish to bring out one point which has been called to my attention. This plant had a poor power factor. This was largely due to the fact that a number of the early type of slow speed vertical motors were used. In fact, this is one of the first plants to be equipped with this form of motor. Many of the defects in the early types were eliminated in the newer motors due to cooperation between the plant management and the electrical manufacturers. In this case the power factor was not a serious item as the generators and distribution cables had ample capacity to take care of the extra current. The load factor on the contrary was very good and this has probably been confused in the lay mind with the other term, which is of less importance.

It may be said that this is all very well in a new plant, but how about a plant now operating with a line shaft drive? Will it pay to make the change?

The situation should be carefully analyzed and comparisons made with electrically driven plants. There is very little doubt that money wisely expended for electrical equipment will pay a much better rate of

interest than the investment in the plant as a whole. In many cases the saving per year would amount to as much as 50% of the investment required for making the change.

CONCRETE ROAD EXPERIENCE IN OHIO

By H. D. Bruning

Examinations of the twenty-nine concrete roads, totaling 39.63 miles, that have been built by the Ohio State Highway Department since 1910 have led to the following conclusions: Intelligent inspection and the use of only first-class material are essential to insure permanency; bank-run gravel or crusher-run limestone should never be used; a rich mixture is necessary as a factor of safety against irregularities in the mixing and placing of concrete; the wearing quality of the pavement is often impaired by insufficient protection against too rapid drying; there is no apparent difference in the permanency of pavements constructed on flat or crowned sub-grades; the weakest points are at the expansion-contraction joints; tarred felt is preferable to a poured joint; the shoulder should be reinforced by stone or gravel macadam for 1 to 2 ft. next to the pavement; a bituminous surface treatment is not essential; there is no special value in roughening the surface of the concrete preparatory to putting on the surface treatment; asphalts used as a surface treatment for concrete have peeled more than tars; and, finally, first-class concrete pavements have every indication of ability to stand up under heavy steel tire traffic.

Failure of Bituminous Carpets

The results thus far obtained in applying a bituminous mat to twenty-three roads have rather discouraged further general application. The method follows: After the concrete is well hardened (not less than 10 days after placing) tar or asphalt heated to from 200 to 250 deg. Fahr. is applied, $\frac{1}{2}$ gal. per square yard, and spread uniformly over the surface. While the tar is still soft there is applied a layer of coarse sand or pea gravel in the proportion 1 cu. yd. to 100 sq. yd. of surface. This forms a mat varying in thickness from $\frac{1}{8}$ to $\frac{1}{4}$ in. Present specifications limit the covering to tar products and gravel, ranging in size from $\frac{1}{8}$ to $\frac{1}{4}$ in.

The data obtained in an inspection just made by the speaker and Harwood Lersch, division engineer, show that on only four of the twenty-three roads has the bitumen given good results; on all others it has peeled off in varying degrees. An examination of the tar mat that peels off almost universally shows that adhering to its under surface is a film of inert mortar, from $\frac{1}{32}$ to $\frac{1}{8}$ in. in thickness. It thus seems that the peeling is not due to failure of the adhesion of the tar to the concrete, but either to an action of some ingredient in the tar on the concrete surface or, more likely, to the nature of the concrete itself, which makes it possible for the tar to pick up the top film of the concrete. Where the treatment is an oil asphalt, this condition is not true, and it is the experience of the department that such a product cannot be successfully made to adhere to the concrete.

Examination of the various roads reveals that tar mat filled with sand wears off much faster than one filled with pea gravel, which will resist abrasion to a higher degree. The treatment of tar and sand on Road 11, Youngstown-New Bedford Road, indicates a probable life not to exceed two years, having worn down to a thin mat not exceeding $\frac{1}{16}$ in. after a use of only seven months under heavy mixed traffic. At a cost of 9.5 cents per square yard, an average cost on

all roads treated, the maintenance would be rather excessive.

An interesting fact has revealed itself on Section 19 of the South High Street experimental road at Columbus, constructed under force account by the maintenance bureau of the department. A Dolarway treatment was applied at the rate of 0.36 gal. per square yard, and covered with coarse sand. A 33-ft. strip at the south end of this section was given two applications of the tar and sand. The part given one application peeled badly, while the other is in good condition after fifteen months' use under very heavy mixed traffic. On Section 20 of this same road, where Tarvia was used, what peeling has taken place has been on the parts which received the least tar.

Tar for Small Repairs

Owing to the apparent short life of the bituminous wearing course as heretofore applied, it would appear uneconomical to apply or maintain on the pavements thus far treated. However, the use of tar for treating cracks which develop in the pavement and of tar and mineral aggregate for patching defects such as worn joints and holes is very effective, and apparently the cheapest method of maintaining a good surface on such a road. Such repairs should be made at least once a year. Cracks, joints, or depressions should be swept clean of all foreign matter before the heated tar is applied. The mineral aggregate should be clean, thoroughly dry, and in size practically as large as the depth of the hole. If fine material is used the traffic will drive the tar to the top. This tar concrete should be thoroughly tamped. While asphalt may be used for filling joints and cracks, it is usually advisable to repair depressions in the surface at the same time, and for this latter purpose tar has given the best results.

The average cost of the concrete pavements completed to date is \$1.128 per square yard. This cost is the contract price paid and does not cover engineering and inspection, but does include the cost of grading and finishing of shoulders and ditches and a small amount of accessories. Deducting from this average cost the average cost of surface treatment, which is 9.5 cents per square yard, there remains \$1.033 as the average cost per square yard of plain concrete, including grading, shoulders and accessories. The average cost of grading, finishing of shoulders, and ditches and accessories is \$0.167 per square yard of paved surface. Deducting this from \$1.033 we have 86.6 cents as the average cost per square yard of the plain pavement alone, exclusive of engineering and inspection costs.

THE SILO

At the present moment our common enemy, the high cost of living, is facing a new foe. Having lorded it over pocket and larder for many a moon, this devourer of dollars now sees in the silo a real menace to its reign.

For anything that lowers the cost of beef production from 1 to 2 cents a pound and of butter production from 6 to 10 cents a pound must be ranked as formidably inimical to the aerial scale of prices for foodstuffs which has prevailed these last few years.

To say the silo will do this is not enough. Repeatedly within a decade it has done even more. In every farm state in the Union, notably those corn Klondikes of the vast middle west, it has exceeded the most optimistic predictions of its sponsors. And it is the unanimous opinion of our able agricultural experts that when every farm where stock is fed has a silo—as probably will be the case within a few years—an annual waste of nearly \$1,000,000,000 shall have been eliminated.

Read what the government has to say about this preventable loss:

The greatest waste in any single industry in this country is made with the corn crop. The grain of the annual corn crop of the United States is worth on the farms one and one-half billion dollars. In a ripe corn plant 60 per cent of the feed value is contained in the kernels and 40 per cent in the stalk and leaves. With the grain worth one and one-half billion dollars, the feed value of the rest of the crop is a billion dollars. At least 90 per cent of the feed value of the stalk is lost under the present system of farm management—a waste with this crop alone of almost a billion dollars yearly.

The silo conserves the 40 per cent of feed value in the stalks and leaves.

"But what is a silo?" asks the urban contingent.

It is a tight-walled chamber—a pit or tower—into which ripe corn, stalk, leaf and ear, or alfalfa or sorghum is packed as solid as possible after having been cut into inch lengths or shorter.

"It is a combined storehouse, self-cooker and laboratory," says the latest report of the Kansas state board of agriculture, in which the process of silage preparation thus is described:

Fermentation, which starts as soon as the silo is filled and closely packed, causes the temperature to rise to an average of 150 degrees for a period of some two weeks. In this manner the contents are partially cooked and much of the coarse material otherwise wasted is converted into wholesome food.

Weed seed, always abundant in silage, is cooked by the intense heat and its germination destroyed. The high temperature liberates certain acids; these disintegrate the woody fibers, liberate the cellulars and, in short, partially predigest the food.

The silo converts the waste roughage of the farm into stock food. It conserves space and makes feeding as easy chore. It provides succulent food throughout the year, regardless of season; reduces the cost of beef, pork, and dairy products and paves the way for a better profit on the livestock and farming business.

In a recent discussion of this new aid to successful farming, the Orange Judd Farmer said: "The silo furnishes a means of bridging the widening disparity between meat-production and population, through a complete utilization of the feeding stuffs produced and the consequent ability to grow and fatten more cattle per acre of farm land than is possible under any other form of cattle-feeding."

We speak of the silo as "new" only because its widespread adoption in this country is a matter of very recent history. In principle it is one of the most ancient of agricultural developments.

When Athens was the proud center of civilization, Greek tillers of the soil preserved their grain and green feed in underground pits, and in the days of Julius Caesar, this practice was even more common among the Romans, from whom it descended to the peoples of northern Europe. For centuries these dwellers in lands of uncertain weather and low summer temperature have thus compensated themselves for lack of time in which to cure hay.

Adolph Richlen, a German sugar manufacture, built the first tower silo in 1865, and a few years later a French farmer named Goffart called world-wide attention to the value of silage. A year prior to the Centennial a college professor in Michigan put up the parent of all our present-day silos, and though for more than a quarter century their spread was slow, within the last decade, and especially the last three years, they have been built by thousands.

A silo census of thirteen midwest states the first of this year gave the total number as 131,000, and of these, 31,000 were put up during 1913. Wisconsin leads, with

an average of one silo to every four farms, and throughout the eastern half of the nation it is estimated there is an average of one for every dozen farms.

Most of these are above ground, being built of lumber, cement, tile, metal or stone, and ranging in height from 20 to 75 feet and in diameter from 12 to 22 feet. Their capacity runs from 30 to 400 tons, and the cost of filling them from 40 to 75 cents a ton.

The latter operation is performed with the aid of a gas or steam engine, which furnishes power for the knives that cut the fodder and the air-blast that blows it up a large pipe into the silo, whence it falls, to be tramped down by two or three men within the tight-sealed tower.

As a rule, the silo is built in or near the big barn, and even in the worst of winter weather the matter of feeding is a simple and easy task. But the time and labor saving features of this spreading system of "canned corn," as it has been aptly called, are the least of its economic virtues.

As was said by one of the best known farm journals not long ago, "the economic importance of the present development of silage feeding would be hard to overestimate." Then followed this detailed statement:

About 70 per cent, or roughly, 75,000,000 acres, of our corn area is used to produce corn to be fed upon the farm. Husking and gathering this corn not only constitute one of the hardest manual tasks performed upon the farm, but is one of the largest items of cost in growing corn. An acre of corn land produces perhaps one ton of corn and eleven tons of stalks, blades and husks.

The corn is separated at great labor and expense, and then the eleven tons of feeding material is allowed to go to waste, an incumbrance in the field, except as a small part is utilized by the pasturing of cattle for a few weeks at the close of the year. It follows that on 75,000,000 acres devoted to the growth of feed for farm animals by far the greater part of the annual growth of feeding material is absolutely thrown away. The use of the silo will prevent this waste and make it possible to utilize in meat-production twelve tons of feeding material per acre instead of the one ton now so utilized.

The general and marked advance in the price of farm land during the last few years has forced farmers to consider ways and means of making their acres more productive. The prevalence of unusually hot and dry weather in the richest agricultural sections of the land during the summer of 1913 forced those who did not have silos to set about getting them, for in a large measure the silo will solve the drought problem.

In even the driest seasons, fairly good silage in either sorghum or corn can be grown, and a crop "failure" can, with the aid of the silo, be transformed into a success, so far as feed is concerned. But whether seasons be lean or fruitful, the silo stands as a great conservator, for not least among ways of robbing the soil of fertility is the practice of growing a bumper crop of corn, harvesting the ears and leaving the remainder to go to waste.

About 40 per cent of the nutritive value of the plant is in the leaves and stalk. To produce this, the soil gave up a certain amount of its fertility, and any system of storage that keeps this fruitage of soil-energy from waste is a safeguard against soil depletion and ultimate want.

The silo does this.

It does more than this. Not only does it save this 40 per cent, but preserves it in a form that produces better and cheaper results than can be got through regulation grain feeding.

During the past winter and spring the Ohio experiment station conducted a test with ten dairy cows "to determine what effect the feeding of more silage than is usually fed by dairymen, with a corresponding reduction in the grain portion of the ration, might have upon the

production of milk, butter fat, gain in live weight, cost of ration and consequent profit." The cows fed silage produced 96.7 pounds of milk and 5.08 pounds of butter fat, while those fed on the grain ration produced 81.3 pounds of milk and 3.9 pounds of butter fat, on an equivalent amount of feed.

The cost of feed per hundred pounds of milk was \$0.687 from the silage ration and \$1.055 from the grain ration. The cost of feed per pound of butter fat was 13.1 cents with the silage and 22.1 cents with the grain ration. The average net profit per cow per month (over cost of feed) was \$5.864 from the silage and \$2.465 from the grain.

Figures like these only serve to emphasize the great economic value of the silo. Any medium that will save 40 per cent of efficiency, and so enrich this saving as to make it productive of more profitable results than could be obtained from the original 60 per cent of available nutriment, is worthy of consideration by all classes—philosophers as well as farmers, and notably those who desire to be called statesmen.

products you would have the expense of hauling to cars. It is well to bear in mind that a location that will afford good advertising—or, in other words, a location that is passed by a great many people—is a great advantage. If your plant is easily reached and not stuck away in some out-of-the-way district, it is much easier to get the architect, contractor and builder to go and see your product.

In starting a plant you must study the wants of your community and the amount of business that you will probably be able to do. You must be acquainted with the cement block business, or be able to employ someone who is, to be able to start in the right direction.

After you have studied the above points and have come to some conclusion as to the amount of product that you will want to turn out, then you can take into consideration the amount of capital it will take to run the business. You should have quite a little working capital after your plant is installed and paid for.

Do not locate your plant in low ground unless you



California State Building. World's Fair, San Francisco, California.

The silo has changed the skyline of our rural prospects in all parts of the land. In a very real sense its legions stand like a far-flung line of towers of defense—guarding us against the one enemy this nation has largest cause to fear—economic waste.—[Philadelphia North American.]

THE CEMENT BLOCK BUSINESS

One of the first and most important things to do on entering the block making business is to study out the best possible location for your plant. One must be sure that there is a demand, or that a demand can be created, for the manufactured product. You should consider the cost of sand and gravel, and whether blocks could more cheaply and profitably be made in some other locality and shipped to where you think of locating.

A concrete block plant should be located upon a railroad, as this will save the expense of hauling cement, coal, sand and gravel, and these nearly always can be bought in carloads for less than they can in small quantities. The location should be such that in hauling the finished product to any part of your city you would have good roads. If your sand and gravel come from banks near by you would still have a saving on your cement and coal by being located

on a railroad track; and when shipping out cement are able to fill the same so that water will not stand in your yard, as generally your heaviest business is done in the factory in bad weather when you are unable to do outside work. In low, soft ground it is almost impossible to haul a reasonably good load out of the yard, and teaming is one of your biggest expenses.

In buying cement, be sure and buy a Portland that is guaranteed to meet the standard tests. The care of this cement is an important factor. It should be stored in a dry storage house, so as to be always in prime condition.

A great deal of care should be taken in the selection of sand and gravel or crushed stone. Sand for concrete block work should be reasonably coarse and sharp; it should be free from all loam, or as nearly so as possible. The gravel should be of a good grade and clean, the same as the sand. If necessary, to obtain good results, these materials should be washed. If crushed stone is used, it must be free from dust. To obtain good results in concrete blocks your gravel and crushed stone should not run larger than $\frac{1}{2}$ to $\frac{3}{4}$ in., and your proportions should be as nearly accurate as can be obtained. Under no circumstances should you guess at the amount of your materials, as if your proportions are right you will always obtain the same

finished product and your blocks will always be uniform in color and strength.

After your location is obtained and your sand and gravel or crushed rock are found to be suitable for the work, and the capital, which is the most important side of the business, is provided, you are then ready to begin the erection of a proper building and to purchase machinery and equipment. There are many different ways to erect a building suitable for the concrete block business, but many of them are built entirely too small and are not equipped with sufficient machinery to manufacture concrete products at a salable cost.

One of your first considerations, as already intimated, should be the storage of cement. The size of bin or warehouse will depend, of course, upon the output of your factory; but in no case should it have a capacity of less than 300 barrels, which is two medium-size cars. One of the best factories that can be built is of concrete blocks, and the room for the storage of cement should then be stripped with 2 by 4s covered with paper, and then sheathed over with inch flooring. The floor should be raised off the ground and should be a double floor with an air space between. The ceiling should be the same; the windows should have extra doors so they can be closed and the room kept dark. The cement should never be piled against the wall. If you will follow these instructions you will have very little waste in cement and few, if any, complaints against the cement manufacturer as to the grade of his cement. You should never unload a car of cement during a rain.

In connection with your plant you should have a suitable sized office to transact your business. You should also have a work room, or, in other words, a carpenter shop, where your special forms can be made, and a room for special concrete work, such as window and door sills, caps, and any other special pieces of work that can be made without interfering with the running of the rest of your plant. Your sand and gravel room should be large enough for a week to ten days' run, and, if possible, to hold larger quantities for use in the winter months.

After you have all these apartments and your heating plant arranged to heat them all, the question of equipment is an important one. To be able to manufacture concrete blocks and to sell them at a profit, your plant must be properly arranged and your equipment as near perfect as it is possible to get it. There should be conveyors to carry the sand and gravel from the bins to the mixer. The mixer should be of sufficient size so that your materials will be well mixed—a point too often neglected; and your proportions should all be measured and not guessed at. When the material is well mixed it should be delivered to a table or chute that will convey it to the concrete block or brick machine.

DYNAMITE USED IN FARMING

"Farming with Dynamite" is a booklet published by E. I. du Pont de Nemours Powder Company, Wilmington, Del., containing valuable hints to farmers. This booklet treats on the chief uses of dynamite on the farms. It explains in detail the methods of using this explosive for clearing land of stumps, trees and boulders; road-making and grading, plowing, draining swamps, planting and cultivating orchards, and digging trenches for tiling and pipe lines. It gives the cost of this work in different sections of the country, showing conclusively that these various enterprises conducted by farmers can be conducted with success and economy by the agency of dynamite.

BLAST FURNACE SLAG IN CONCRETE.

With the rapid growth of concrete construction, the advantage of blast furnace slag as an aggregate in reducing the dead weight has made a strong appeal to many engineers. The result has been that the building codes of several large cities have permitted the use of furnace slag equally with any other material ordinarily used for aggregate. An extended series of tests involving the manufacture of five hundred 6-in. cubes, 100 of these to be crushed at each of the several periods, 28 days, 3 months, 6 months, 9 months and one year, has been recently undertaken. As the work progressed, results were such that the number of cubes tested at the 9-month and one-year periods was reduced to 50 each, and it is proposed to crush the remaining 100 cubes at 6-month intervals up to 6 years, 10 cubes at each period. The materials used in the test were all produced commercially, and the work of making the specimens was no better than under ordinary field conditions of construction. Thorough mixing was assured, the work being done by hand.

The cement used was standard Lehigh Valley brand, complying with the standard specifications of the American Society for Testing Materials. The sand used was Jersey gravel. This is not an ideal gravel, but was used because it was the material of the market. The coarse aggregate commercially called three-quarter-inch material all passed the 1¼-in. sieve and were retained on the 1½-in. sieve. All material was in the proportions one part cement, two parts sand and four parts coarse aggregate. The concrete was mixed to the ordinary work consistency, rather wet than dry. The cubes were air stored in a dry cellar, being sprinkled with water once a week. The average compressive strength in pounds per square inch for the various tests are as follows: 28 days, 1561 lb.; 3 months, 1952 lb.; 6 months, 2589 lb.; 9 months, 2841 lb.; 1 year, 2797 lb. A study of the test results shows that while at 28 days, 3 months and 6 months, of the number of individual tests fail to agree closely with the general average, the large percentage show considerable greater strength than the general average. A similar study of results at 9 months and one year shows that of the results not in close agreement that the general average, a somewhat larger percentage falls below this general average than runs above it. However, as the results which are above the general average are much more above the average than the low results are below, it may be assumed that the average results are conservative. This is more evident when it is considered that the sand used was not what could be considered as first-class material. Also, the comparatively small size of the slag aggregate must have lowered the strength of the concrete. The results would also have probably been higher had the test specimen been larger.

The findings seem to point that slag may be employed as an aggregate in competition with broken stone or gravel, since the crushing strength of broken stone or gravel concrete, made under ordinary field conditions, will not generally average much over 1500 lb. per sq. in. at the age of 30 days. From the actual strength of the concrete developed in these tests, its weight per cubic foot, the recognized solubility of slag which permits it to act as a puzzolanic material, its alkaline nature which is especially conducive to rust-proof in the case of reinforced concrete, and from the relatively high combined percentages of silica, alumina and iron, which make for permanency of the resulting concrete, the conclusion is that slag is satisfactory for use as an aggregate in concrete.

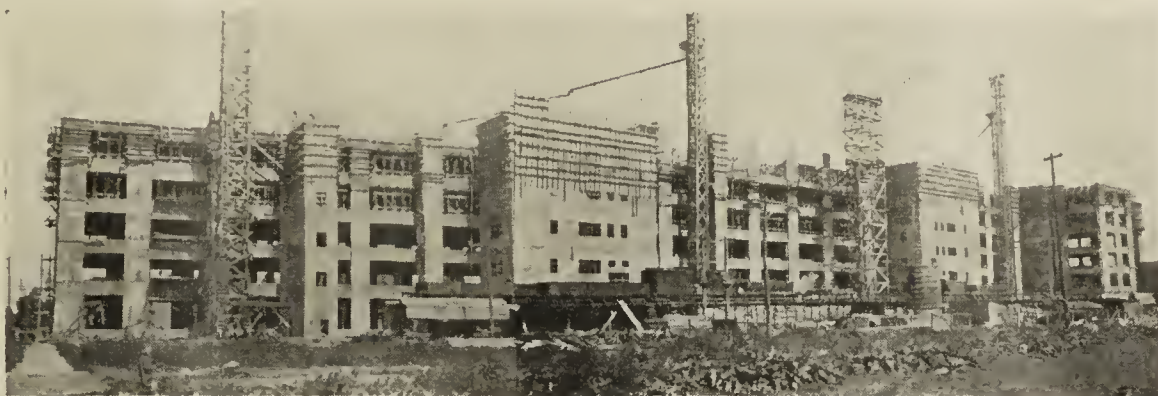
1915 MODEL BRONCHO MIXERS

The Lansing Co., 747 Cedar Street, Lansing, Mich., have just put out an illustrated circular describing their 1915 models of the well-known "Broncho" line of concrete mixers. Cement men who wish to keep in touch with up-to-date developments in equipment, should write for this circular and keep it on file.

Features that appeal especially to contractors are referred to in a letter received by the Lansing Co., from the sales manager of the Savage-Scofield Co., Tacoma, Wash., which firm recently purchased a carload of Broncho mixers from the factory in Michigan. Mr. Rochester, the sales manager, says: "Our dealings are and always have been with contractors of all classes, from the big firms engaged in massive construction work, to the little fellow that you find not only in the cities and suburbs, but also in every village and prosperous farming community. Gradually we have come to know what these men are buying in the machinery line, and we have observed that many of them feel that the prices that mixers have sold for in the past have made them a luxury and a piece of machinery that they could not afford to own. This is partly true; mixers here on the Coast have come high, and these machines have in the main been heavy, cumbersome affairs that made their use difficult, especially

EXCELSIOR MOTOR COMPANY BUILDING

The new building for the Excelsior Motor Co., Chicago, is of reinforced concrete construction throughout, floors, columns and walls, and is one of the largest buildings of its type in the country. It is six stories in height, 583 feet long and of varying width in different portions, the average being 80 feet. It is of the flat slab type of construction, and columns are cylindrical with flaring heads. The depressed head design is used; that is, the slab is deepened for a space about 10 feet square around the head of each column. The column forms consisted of thin metal plates, bent to the desired radius, held in place by steel bands which are equipped with a clamp to tighten them and hold them firmly in place. The flare at the column head is secured by other plates, bent to the desired shape. The columns are reinforced with "Unit" spiral reinforcing, which comes to the job collapsed, with the wires held at the proper spacing by light spacing bars. These spirals are fabricated by the American System of Reinforcing of Chicago. A considerable amount of longitudinal twisted square reinforcement is also used in the columns. All the bars were furnished by the Inland Steel Company. There is no basement to the building, and the lower floor consists of 6 inches of concrete laid directly on the ground without the use of



Excelsior Motor Co.'s New Reinforced Concrete Building, Chicago, Ill.

in the country. A machine was needed that could be hauled about readily from place to place, a machine that would stand the racket of rough streets and country roads, and that would give a good capacity of well-mixed and uniform concrete when it was put on the job.

"It has long been our wish to find something that would meet this very demand, and we feel that in the selection of the Lansing Broncho machine we have found something that just about fills the bill. It is not heavy and cumbersome; it is well built; the loading hopper is low enough so that a man can shovel right into it without using a loader or building a high platform. The discharge chute, on the other hand, is high enough so that any ordinary wheelbarrow or cart will pass beneath it to catch the concrete. It is an easy machine to keep clean, too; it is a rapid mixer and will keep a good-sized crew of men hustling."

HOISTING ENGINES

Probably the greatest record of hoisting engine production made by any one concern is that of the Lidgerwood Manufacturing Company, New York, who have built more than 37,000 steam and electric hoists during the forty odd years that they have been in business.

A comparison of the various types of machines built by this company today with those of thirty years ago, and still in use, is very interesting from an engineering standpoint and shows the marked advance in the way of time and labor saving improvements, that has been made in hoisting machinery practice.

The accompanying illustration is a general view from the west during construction, showing hoist towers, spur track and beginning of chimney. Materials other than concrete are hoisted to the upper stories of the building by means of a double platform elevator hoisting tower operated by a Lidgerwood hoist located between the two concrete plants, and a single platform elevator at the extreme north end of the building operated by a Lidgerwood hoist. On the top of the double platform tower is a derrick held erect by guy wires, which does the hoisting of form work, etc., too bulky to be handled on the elevators. This derrick is operated by a Lidgerwood hoisting engine.

The building is not entirely devoid of ornamentation. Along the top of the first story, in the panels between windows, are ornamental conventional designs in squares and triangles of red concrete work, which are made on the inside of the building by hand mixing and cast in wooden form boxes. These blocks are about two inches thick, and the back or invisible portion is of gray cement, while the face is colored by red paint coloring in the mortar to a rich red, which is troweled smooth and the block is allowed to set. Use is also made of terra cotta decorations in designs of leaves and scrolls, with panels bearing a winged wheel as emblematic of the purpose of the building.

John Ahlschlager Son & Co., of Chicago, were the architects and engineers. The building was erected by Wells Brothers Co., also of Chicago, who have had much experience in erecting large reinforced concrete buildings, and Medusa Gray Portland Cement was used exclusively to the extent of 35,000 barrels.

A LARGE CONCRETE BRIDGE

The Grafton bridge spanning a canyon in the environs of Auckland, New Zealand, is considered by many engineers to be the largest concrete bridge.

The bridge was designed and constructed by the Ferro Concrete Company, of Australia, and Wilson Brothers Portland cement was used, which is manufactured in Auckland, N. Z.

The bridge is described in detail as follows:

The bridge consists of one central span with two approaches, of which the western is of two spans of 35', and four of 75', and the eastern is of three spans, two being of 83' and one of 42'. The bearing plates for the girders are fixed on the piers, with ample room for expansion.

The two main piers completing the approaches stand 100', and are cylindrical, the walls being from 12" to 8" in thickness. On the top or head of the pier curved cantilever brackets carry the footpaths over the piers, and serve to embellish the pier heads. The piers are really built on three walls, and between the walls sit the abutments, being entirely independent of the piers. Into the abutment is fixed a thrust plate or steel grillage set to an angle normal through the line of thrust, and upon this plate rests a hinge supporting the whole arch.

The arch span is 350', and is three-hinged. It consists of two ribs ranging from 6' at the abutment to 9' 6", graduating to 5' at the crown. These huge ribs are tied together by beams, which act also as wind braces.

The height from the deepest part of the gully is 147', the width of the structure is 37' over all, including the roading and footpaths, the road being 24' and the paths 12' each.

The parapet is concrete 4' 9" high, and carries twenty-six lamp posts, lit by electric light. The curbs of the paths are of Coromandel granite, and the grade of the bridge is one in seventy-four, with a total length of 950'.

The superstructure consists of T-shaped piers, this form being selected for its lightness; the longest pier is 80', and the whole is braced by two T-shaped beams. These piers are constructed on arched rings at 21' centers, and support main girders, the girders carrying the secondary beams of the roading and footpaths.

The decking of the roadway is 6" thick, and is to receive a layer of 1½" Neuchatel asphalt. The footpaths are 4" thick, and will receive a finishing layer of 1½" concrete.

The whole construction is of reinforced concrete, the aggregate being made principally of a lava rock and volcanic ash indigenous to the country.

PROPOSED PARK BRIDGE IMPROVEMENT

Plans for a new Park avenue bridge, in Cincinnati, Ohio, crossing Kemper Lane to connect Park avenue with Eden park, has progressed to such a point that City Engineer Frank Krug, who is supervising their preparation, feels he is justified in announcing that the proposed structure will be the most beautiful of its kind in the country. It will also be distinctive in many of its construction features. The plans have been prepared by Principal Assistant City Engineer Frank Raschig, assisted by Assistant City Engineer E. K. Ruth, under Krug's direction. Park Architect George E. Kessler was called frequently into conference, in order that the viaduct plans and new park plans might

be worked out harmoniously. The cost of the proposed structure, which will be entirely of re-enforced concrete, is roughly estimated at \$100,000. The new structure will form an easy curve to Park avenue. It will have a roadway 40 feet wide, with a 12-foot sidewalk on either side. Its length will be 450 feet. The roadway will be 60 feet above Kemper lane. The main arch will completely span Kemper Lane, and will leave a clearance of 180 feet from abutment to abutment. This will make it one of the largest concrete arches in existence. Columns resting on this arch will support the superstructure. The bridge will be of what is known in technical parlance as "curved beam construction on columns."

The approaches will be of the same constructions.

CONCRETE BRIDGE

The County Commissioners, Cincinnati, Ohio, awarded the contract for the construction of the new concrete bridge over Millcreek, on Wayne Avenue, near the Fair Grounds, to Charles Staab, on a bid of \$37,160. The estimated cost of the bridge was \$51,000. The structure will be the largest concrete bridge in the county, and will have four spans. The Commissioners expect to compel the Ohio Traction Company to pay a portion of the contract price before a franchise will be granted to cross the bridge with street cars.

A NEW FIELD FOR CONTRACTORS

New uses are constantly being discovered for staple articles of trade. The chief uses of dynamite have always been in connection with mining, quarrying and excavating. All general contractors use it to greater or lesser extent in their construction work.

It has also been successfully used for a number of years in stump and boulder blasting. Recently, however, a large agricultural demand for dynamite has been created by the discovery that it could be economically and advantageously used in ditching, draining, sub-soil plowing, tree planting and orchard rejuvenation. Owing to the rapidity with which the interest in the explosive for these purposes has spread among farmers and fruit growers, manufacturers of dynamite have become convinced that the farmers and orchardists of the country are going to afford them as large or a larger outlet for their wares than all other markets combined.

The only obstacle to the development of a very heavy consumption of dynamite for agricultural purposes is the fear of the farmer and fruit grower of the explosive itself. Manufacturers are able to convince them of the advantages of its use; they are able to show them that it is economical and beneficial in many ways.

Contractors are beginning to appreciate the fact that agricultural blasting is a desirable field for them to enter. Several contracting firms have already established branches to attend to agricultural work which has been offered them, or which they have convinced themselves can readily be obtained by general solicitation. Most of these contractors have had so much work offered them since taking up this proposition that they have been compelled to increase their working forces and even then some of them are several months behind with the contracts that they have accepted.

Wherever there is land to clear either of stumps or boulders, there is a field for the agricultural blasting con-

tractor. Wherever there are ditches to be dug or lands to be drained, there is work for him to do. Wherever farms and orchards are becoming non-productive because of so-called exhaustion of soil fertility, wherever new orchards are being planted, there is a demand for the services of a contractor qualified to use dynamite.

The extensive advertising that some of the dynamite manufacturers are doing is in itself creating enough inquiries to keep a large number of contractors busy if they do nothing more than solicit the business created by this advertising. The advertisers are co-operating with the contractors by notifying them of all such inquiries received so as to give them an opportunity to solicit the work. It is indeed surprising what an interest this advertising has aroused among farmers and fruit growers. One of the larger manufacturers has been receiving on an average from 200 to 600 inquiries per day for the past several months. The literature sent out in reply to inquiries is of a convincing character and a large percentage of those receiving it would do consid-

STONE BREAKS ALL RECORDS

The value of the stone production in the United States in 1913 reached the grand total of \$83,732,995, according to E. F. Burchard, of the United States Geological Survey. This is an increase of \$5,539,775, or 7 per cent, over the former record-breaking figures for 1912. The value of the granite produced increased 8 per cent, that of trap rock nearly 23 per cent, sandstone 2 per cent, marble 1 per cent, and limestone over 5 per cent. Besides the statistics of stone Mr. Burchard's report, which is issued as an advance chapter from Mineral Resources for 1913, discusses the stone deposits and resources of the states west of the Rocky Mountains, including Arizona, California, Idaho, Nevada, Oregon, Utah, and Washington. The report is illustrated by three quarry maps. This is the third of a series of three reports which discuss the stone resources of the United States; the 1912 report includes the fifteen middle states west of the Mississippi and is illustrated with six maps, and that of 1911



Showing a Blast of 17 Holes at the Castalia, Ohio Quarry of the Wagner Stone Company. Each of 40 per cent Du Pont Dynamite. Marion Steam Shovel and Vulcan Locomotives Used in This Quarry.

erable work on their properties, requiring the use of dynamite, if they could secure the services of competent blasting contractors to handle it for them.

Contracting firms, especially in the east, where soil fertility is more or less exhausted by years of cropping, are neglecting a splendid opportunity by their failure to make agricultural blasting a branch of their business. The demand has been created for them by the Powder Companies and it requires but the exercise of ordinary business methods on their part to turn a profitable stream of contracts their way. Prices and profits should be very satisfactory, because the farmers and fruit growers, unlike the railroad officials, architects and others for whom contractors usually work, are not accustomed to figuring down to the last cent, and thus while the individual contracts or jobs are smaller, the fact that so many of them in the aggregate can easily be secured and with profits more satisfactory than can be made from general contracting, makes the field a very attractive one.

deals with the stone quarries east of the Mississippi and is illustrated by seven maps.

A copy of this report may be obtained free on application to the Director, United States Geological Survey, Washington, D. C. The 1912 report on Stone is also in stock for free distribution; but the Survey's stock of the 1911 report is exhausted. It is included in Part 2 of Mineral Resources for 1911, however, which is sold by the Superintendent of Documents, Government Printing Office, Washington, D. C., at \$1.10 a copy.

OBITUARY

It is with deep regret that we announce the death of Mr. George C. Walters the amiable president of The Concrete Age of Atlanta, Ga.

Mr. Walters was a pleasant and happy person to meet at all times. His sunny disposition and happy personality will be missed at the coming and all future cement shows.

PYOTT GRAVEL AND SAND PLANT

The production of sand and gravel has grown very rapidly in the last few years, its growth being commensurate with that of the concrete industry itself. The methods of producing sand and gravel have therefore grown to a state of remarkable efficiency, making every new plant which is built for such production in some respects different from every other such plant, and showing a marked contrast to the haphazard and inefficient methods of a comparatively short time ago.

In describing methods of gravel production, therefore, in order to be entirely up to date it is absolutely necessary to take as a basis for such description a plant which has been constructed only a short time. No better one could be found for this purpose than the plant of the Pyott Gravel & Sand Company, at Algonquin, Illinois. This plant, while practically complete, has not as yet gotten under full operation, so that it is an absolutely new plant. In addition to this,

follow the material through to the bins from which it is delivered to the cars for shipment.

A merchantable gravel is very near the surface, making unnecessary the removal of any considerable overburden of loam or clay. The excavation in the quarry is done by a 15-ton locomotive crane with a 46 foot latticed steel boom, manufactured by the Link Belt Company, Chicago and Philadelphia. The company has two clamshell buckets on hand for use as required, in connection with the locomotive crane, one of them being of 1-yard capacity and the other 1½ yards. This crane runs on a temporary track, which is extended into the bank as it is found necessary to move the crane forward.

The clamshell bucket dumps its load of gravel into a movable hopper, which rests above the end of a belt conveyor. This movable hopper, as its name implies, can be carried along to follow the crane as occasion requires. It feeds by means of a gate and trough onto



A 15 Ton Locomotive Crane (Manufactured by the Link-Belt Co., Chicago & Philadelphia) Loading Gravel at the Plant of the Pyott Gravel and Sand Company.

it embodies some features which have not been found in other plants, so that it may be taken as a type of the most modern and approved engineering in this class of industrial enterprises.

The Pyott plant is located about sixty miles northwest of Chicago, on the Chicago & Northwestern Railway, and is in vast deposits of sand and gravel, which have been worked by other companies in close proximity for the past several years.

The plant is rated at a capacity of thirty cars per day by the designers, the Raymond W. Dull Company, 1912-1914 Conway Bldg., Chicago. This would seem to be a conservative estimate, however, inasmuch as smaller plants designed by this company have exceeded this amount of daily output for considerable periods at a time.

The above company not only designed the plant but installed the equipment, much of which is patented and manufactured by this company.

In describing the plant in detail the logical method of procedure would be to begin at the quarry and

the belt conveyor. The trough, as will be noted in one of the illustrations, has a shunt, by means of which the larger stones—that is, the stones too large for the crusher, if there should be any such—are thrown out rather than being delivered to the belt conveyor and reducing its effective capacity.

The part of the belt conveyor onto which the gravel first empties from the movable hopper is known as the sectional field conveyor, and naturally has to have a considerable amount of elasticity in order to follow the movable hopper. Provision is made, therefore, for the addition of sections to this belt as required. This sectional field conveyor is one of the features of the plant which differentiate it from other plants of this general type, which are, for the most part, provided with small cars to deliver the gravel from the bank or quarry to the main conveyor.

In the present instance the handling of gravel is made entirely automatic, from the time it leaves the clamshell bucket till it is delivered as a finished product into the bins ready for shipment.

As will be noted from one of the general views of the plant, the field conveyor empties onto another belt conveyor running at right angles to it, this latter running to the top of the crusher house, where it empties the gravel into a cylindrical screen of $1\frac{3}{4}$ -inch mesh. The material which passes through this screen drops directly onto the main belt conveyor, which carries the material to the top of the bins, ready for screening and washing. The oversize drops from the screen into a No. 5 Austin gyratory crusher. Here it is crushed down to a suitable size for the screen and is chuted directly from the crusher onto the main belt conveyor running to the top of the bins, as before noted. This conveyor has a length of 170 feet and runs to a height of about 60 feet above the ground.

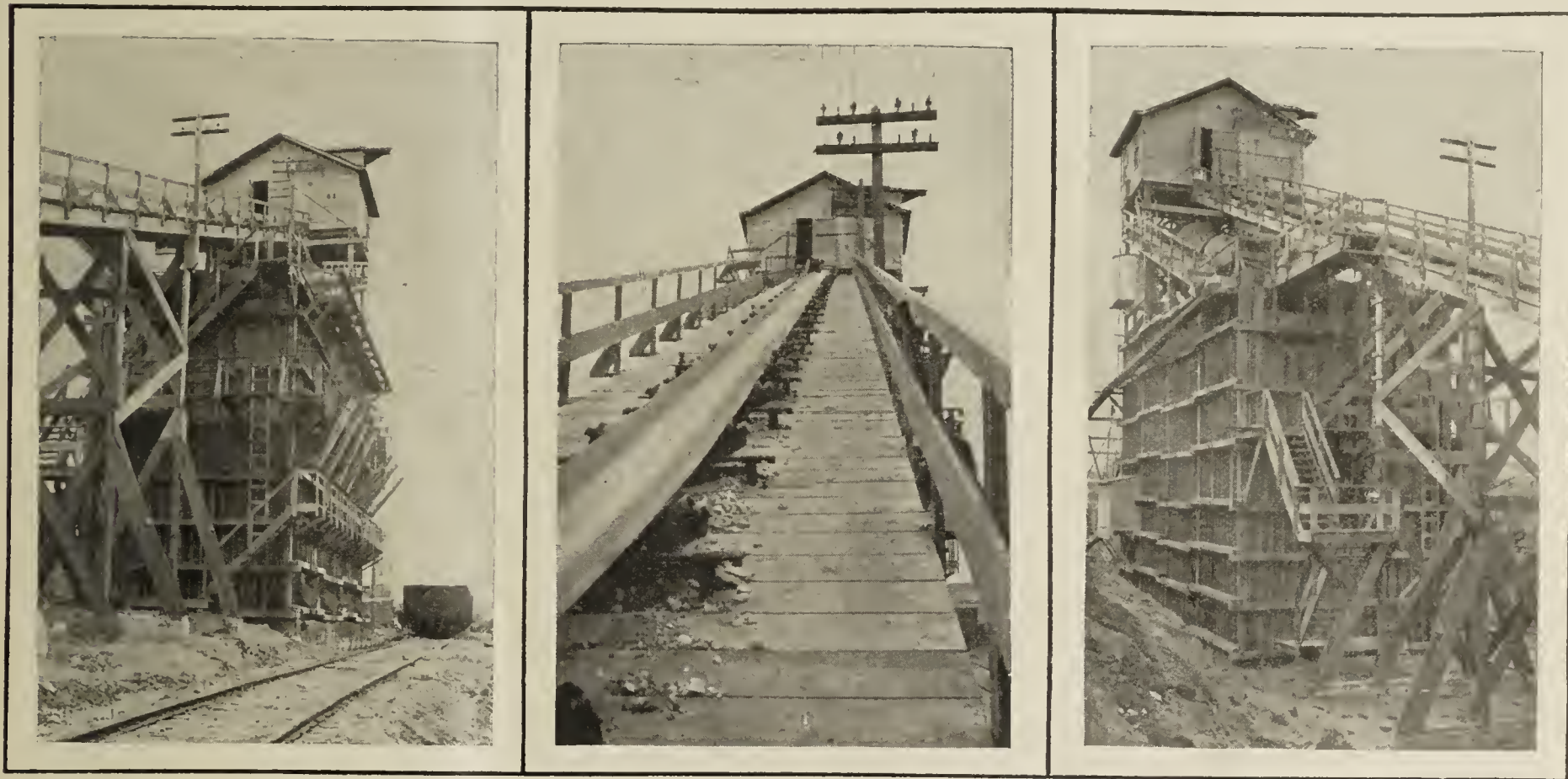
From the hopper into which the belt conveyor discharges the material goes automatically to two rows of three each of Dull inclined conical screens. This screen is the latest type devised by this company. Each set of three screens is mounted on the same shaft, dispensing with separate drives for each screen, with the attendant line-shafting, bearings, gears, sprockets, chains, etc. These screens are also open at both ends,

The plant is fitted throughout with 24-inch 6-ply canvas belting. The entire equipment has been designed, however, with the idea of doubling the plant at some future time, which can be done by the substitution of 30-inch belting for the 24-inch, and by the addition, of course, of another set of screens and by duplicating the bin equipment.

Water is supplied to the screens and to the conical sand separators by a 6-inch Morris centrifugal pump, direct connected to a motor. All the machinery is motor-driven throughout. The main motor driving the belt conveyor and screens is 50 horsepower, while a 35-horsepower motor drives the crusher, and a 25-horsepower motor drives the short incline conveyor and cylinder screen. The sectional field conveyor is driven by a 30-horsepower motor.

TRAP ROCK

The Texas Trap Rock Company own the first and only trap rock quarry in the State of Texas, as this rock is quite rare there. Their quarry is located at Knippa, Tex. The rock is of exceptionally high grade, as compared with the trap rock of the eastern states.



The Bin and Screen House, with Belt Conveyor Carrying up the Gravel.

and the material travels differently in this type from other types of screens, being delivered into the large end and traveling towards the small end. It is the large end of the screen which does the principal work, and it is considered by these people the logical end for doing the work, inasmuch as it has more perforations, more wearing surface and more capacity in every way. The screens have longitudinal joints so that they can be dismantled from the shaft without disturbing the shaft. Runways are also provided on both sides of the screens to make them accessible. In each pair the screens are sized, respectively, $1\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{4}$ inches, that is, this is the size of the perforations in the shell of the screen. The fine material from the last screen goes through two Dull conical sand separators, where the water and filth are carried off and the clean sand automatically discharged into a bin.

The bins for the four different sizes of product are each about 20x12 feet in dimensions, and 37 feet high. A railroad siding runs along one side of the plant, and each bin has two gates operated from a running gallery, for delivering the materials to cars.

It has a crushing strength of 30,500 pounds to the square inch. The 72-inch outflow sewer for the City of San Antonio's new sewer system has just been awarded to reinforced concrete, using Texas trap rock, in competition with brick and tile sewer systems. Their equipment includes crushing rolls, 30"x14"; also two Allis-Chalmers, Gates crushers, No. 8 and No. 5, and Allis-Chalmers revolving screens and elevator buckets. Their power plant is operated by one 220 H. P. Murray Corliss engine and two 6'x16' steam boilers.

CEMENT MILL NEWS

The Lehigh Portland Cement Company, Mason City, Iowa, has recently installed a Bucyrus 14-B revolving shovel. The machine is being used to strip the overburden from the rock deposits and do away with the slower hand labor. It is expected that this machine will lessen overhead expenses and have a tendency to increase the output of the big shovels in the rock.

Among The Cement Mills

"OUTDOOR STORAGE OF CLINKER"

The advantage of outdoor storage for Portland cement clinker with gain in grinding capacity of the finishing mills and increased opportunity for weathering or seasoning, is well known. It is not the purpose of this article to enter into a discussion of these.

Such storage is under roof, while the clinker dealt with by the writer was stored in the open. Clinker thus stored would usually require drying before it could be ground. When clinker has been exposed to the weather, sun, rain, snow, freezing and thawing for a long period, some of it disintegrates and there is a certain amount of reaction between the clinker and moisture, producing an hydration of some of the constituents of the clinker. This is true with a normal or good clinker and to a greater degree with an under-burned clinker or clinker from an improper raw mixture.

The following tests were made to determine to what extent, if any, clinker will deteriorate when subject to such conditions of storage. The tests were made on an average sample of run of mill clinker which had been exposed to the weather from three to five years. The sample was dried, mixed with gypsum to give 1.75% S.O.₃ in the resulting cement. All was ground in a Weatherhead crusher to a fineness of 92% on a 100-mesh screen.

Tests were made for setting time, soundness, and tensile strength. The amount of water for normal consistency was slightly in excess of the amount usually required in our laboratory.

Fineness, 100 screen, 92%.

Initial set (Gillmore needle), 55 min.

Final set (Gillmore needle), 2 hr. 35 min.

Pat in steam, 6 hr.; hard on glass.

Tensile Strength:

1 day neat, 150, 160, 180; av., 163.

7 day neat, 510, 500, 490; av., 500.

7 day sand, 200, 210, 220; av., 210.

28 day neat, 500, 560, 590; av., 566.

28 day sand, 300, 300, 270; av., 290.

Our average tests for the same periods follow:

Fineness on 100 screen, 95%.

Initial set, 2 hr. 30 min.

Final set, 5 hr.

Pat in steam, 6 hrs. Hard on glass.

Tensile Strength:

1 day neat, 370, 370, 370; av., 370.

7 day neat, 700, 740, 750; av. 730.

7 day sand, 250, 300, 310; av., 286.

28 day neat, 800, 830, 830; av., 820.

28 day sand, 340, 350, 345; av., 345.

The tests on the weathered clinker fall below the average tests of our cement for the same periods, but, with the exception of the 1 day neat and 28 day neat tests, would pass standard specifications.

Grinding samples on a small scale and in a different style of mill from those used in the works for the regular production will have a certain influence on the result and it has been the writer's experience that these small experimental grinds usually fall below the results of the run of the works.

But from the figures as given, the writer concludes that a long exposure of good clinker to the weather may cause some deterioration, but not enough to cause the resultant cement to fall below standard specifications.

E. W. OLDHAM,

The Diamond Portland Cement Co.

TIME OF SETTING CEMENT

It was pointed out by Mr. S. M. Williams, in a paper read before the American Society for Testing Materials, that the factors accountable for the variable results obtained in the time of cement setting make a marked difference in the laboratory results. His paper summed up the results of considerable investigation, throughout which the various influences were properly controlled and recognized. The following factors are enumerated as likely to cause errors of considerable magnitude:

1. Variation in the amount of work done on the material may cause a difference of more than two hours in the time of initial setting and cause a normal cement to appear quick setting;

2. Variation in atmospheric moisture or humidity of storage during the setting period may cause the initial time of setting to vary as much as two hours;

3. Variation in atmospheric heat or temperature of storage during the setting period may vary the time of setting as much as one or two hours.

The determination is also affected, to a less extent, by factors peculiar to the Vicat and Gillmore methods.

Throughout this series of determinations an attempt was made to keep all conditions uniform except the one whose effect was to be noted. In practice, the results obtained on two consecutive days may be affected by several factors which might combine to increase or decrease the range of values. For instance, a cool, damp day may be followed by a warmer day with a high relative humidity. The two factors on the first day both tend to retard the setting of the cement, while the high temperature of the second day, tending to shorten the time of setting, is opposed by the high humidity which reduces the amount of evaporation. To avoid the effects of these variables requires the use of a storage closet whose temperature and humidity can be controlled.

The variation in time of setting as determined by the same observer, thereby eliminating all errors due to personal equation introduced by several observers, is clearly shown, and indicates that neither method will give results consistent enough to justify the reporting of results within the limits of a few minutes.

The other variables, such as formation of the test specimen and manipulation of apparatus, are of smaller importance, compared with those of mixing and curing, but these errors may combine to increase those caused by the above.

The results obtained by varying the amount of work indicate that the test, as made at present, can be relied upon only to identify normal or slow-setting cements. The necessity for vigorous working in order that a normal cement may not be judged quick setting, defeats the object of the test when it is applied to a very quick setting material, and may cause the set to be broken.

A study of the results makes it evident that neither the Gillmore or Vicat methods can be relied upon to give uniform results unless all factors which influence the rate of hardening are taken into account and controlled, and they further explain why comparative tests in a number of laboratories upon the same material have been found to give most variable, non-dependable results, cement often being adjudged quick setting in one laboratory and slow setting in another.

FREIGHT RATES ON CEMENT

Charges of freight discrimination and demands for readjustment have been filed with the Interstate Commerce Commission by the Kosmos Portland Cement Company, through their attorney, J. V. Norman, of Louisville.

The complaint specifies discrimination in favor of Hannibal, Mo., and Sellersburg and Mitchell, Ind., and is made against forty-four railroads in the Central and Southeastern Mississippi Valley Freight Association territory.

The Kosmos Company, which ships about twenty carloads of cement a day, alleges that the present rates, in force since the factory started in 1905, are unreasonable as well as discriminatory, and that loss was suffered through payment of excessive charges, and a greater loss by the inability of the company to procure business at competitive points.

Kosmosdale, according to the petition filed with the commission, is assessed from 1 to 3½ cents per 100 pounds more to Southern Indiana and Illinois points than is Sellersburg. The Kosmosdale company claims its rates to these points should be the same as those from Sellersburg, except the additional bridge charge. It is also claimed that Sellersburg is given lower rates on shipments through Louisville to these same points when in justice the Kosmosdale rates should be lowest.

The Kosmos Company charges discrimination in giving a preference of 2 cents to Sellersburg in the shipment of freight through St. Louis, although both Sellersburg and Kosmos have the same rate to St. Louis. It is also charged that Sellersburg, which is twelve miles north of Louisville, is given a preference of 3 and 4 cents to points in the East, while Kosmosdale, which is eighteen miles west of Louisville, is given no preference to West Tennessee and Mississippi River points. It is charged that the Sellersburg rate to certain points in Eastern Kentucky is from 2 to 4 cents lower than the Kosmosdale rate, although the distance is about equal. The general charge is made that rates from Sellersburg and Mitchell are lower in every instance than Kosmosdale rates to Anderson, Brazil and Columbus, Ind.; Danville and Lawrenceville, Ill., and Loveland, O.

ECONOMY OF BULK CEMENT

The Economy of Bulk Cement, is the title of an attractive booklet, issued by the Universal Portland Cement Co., Chicago, Ill. The ordering of cement in sacks is a firmly established habit. The sacks are not needed, sand and stone are not bought that way, but buyers are accustomed to the sack way for cement. Under certain conditions the handling of cement in sacks is necessary. But there are conditions under which the bulk method is preferable. This booklet tells when it is so. It says, in part:

"When cement is being used direct from the car to the mixer, at the rate of half a car a day or more, it should be handled in bulk. Bulk cement is carried in stock by the cement manufacturers, and cement must be reduced to a bulk condition before it goes into the mixer. Therefore it is wasteful from every point of view to put the cement into sacks if it is to be emptied out of them as soon as it is taken from the car, particularly since bulk cement is much less liable to damage in transit, either through weather conditions or breakage, than is cement in sacks. Bulk cement should be used in factories where concrete products are made. These factories may easily be equipped with bins and mechanical devices by means of which the cement can be unloaded, stored and delivered to the mixer at a cost for labor so small as to be negligible. Every concrete

products factory carries a considerable investment in cement sacks, both filled and empty. This is a losing investment. An investment in bins and machinery would be a permanent and profitable addition to the value of the factory."

The booklet estimates that cloth sacks cost cement users easily 5 cents per barrel without figuring interest or money tied up in sacks, both filled and empty, and other items of expense that might justly be added. It then proceeds to show how bulk cement saves both labor and capital.

RUNNING FULL TIME.

"Our plant at Leeds has not yet felt the effects of the war. We are running full time, and expect to continue to do so."

This statement was made by J. Ross Hanahan of Charleston, S. C., president of the Standard Portland Cement Co., following a visit of inspection by him and other officials of the Standard to its plant at Leeds. Mr. Hanahan said further:

"In seven years we have increased the capacity of the Leeds plant from 70,000 barrels per year to 750,000 barrels. We have recently enlarged and may possibly have to make still further enlargements in the near future.

"Instead of the war hurting our business we believe that it has been enlarged. The business situation is growing better all the time.

"All the members of the board of directors of the Standard Cement Company are pleased with the operation of the plant at Leeds and also with all they have seen in the Birmingham district."

Accompanying Mr. Hanahan on the inspection trip were the following directors: R. H. Smith, of Richmond; M. R. Rosenbaum, of Richmond; Charles Cartlett, of Staunton, Va., and J. Fred Efenger, of Washington, D. C.

J. I. McCants, sales manager of the Standard, and F. H. Lewis, consulting engineer, were members of the party.

ANNUAL MEETING OF CEMENT CO.

The last year has been the most successful year in the history of the business of the Northwestern States Portland Cement Company, according to the annual report presented by C. H. McNider, president of the company, at the annual meeting of the stockholders.

About fifty stockholders of the company were in attendance at the meeting and following the presentation of President McNider's report the stockholders extended a vote of thanks to the management for the successful operation of the plant during the current year.

The following officers were re-elected for the coming year: Charles H. McNider, Mason City, president; A. F. Frudden, Dubuque, vice-president; F. E. Keeler, Mason City, treasurer, and F. G. Ray, Vinton, secretary.

FREIGHT RATES ON SAND.

Charging that 5 per cent increase in rates on sand by Ohio railroads, as authorized by the Interstate Commerce Commission, recently, is excessive and discriminatory, and will prevent it from competing with other sand shippers in Pennsylvania and West Virginia, complaint has been filed by the Toledo-Owens Glass Sand Company, Toledo, with the State Utilities Commission. The commission is asked to suspend the increase in rates until after a hearing of the complaint and cancel them thereafter.

OUTLOOK OF THE CEMENT INDUSTRY FOR 1915.

C. H. Sondhaus.

The following factors must be considered, as affecting the cement industry for 1915:

1. Agricultural prosperity.
2. New markets.
3. Higher prices for lumber.
4. Financial conditions.

1. **Agricultural Prosperity.** A prosperous year is certain for the farmers, owing to shortage of food-stuffs produced in Europe. The increased demand for agricultural implements bears out this statement. Prices of farm products should be high, and a considerable part of the farmers' money will be spent for cement.

2. **New Markets.** Cement companies are actively engaged in introducing their products in Cuba and South America. The cessation of European competition leaves us a largely increased foreign market. The year of 1915 will see exports of cement gradually increased, curtailing the supply available for home consumption. The establishing of Federal Reserve branches in South America will materially aid our credit relations. The lack of credit facilities has been the greatest barrier to our exploiting of the South American markets.

3. **Higher Prices for Lumber.** The increase in demand for lumber, with resultant high prices, will cause a larger substitution of cement than ever before. This increased demand for lumber at the close of the war, is certain. Lumber is scarce in Europe, and of our exports of \$63,171,000 worth last year, practically 50% went to Europe. Considering the amount necessary for them to use in rebuilding it is reasonable to believe that Europe will call on us for a largely increased amount of lumber.

4. **Financial Conditions.** Financial conditions next year should be materially improved. Our imports from Europe having fallen off so greatly, will result in the balance of trade becoming largely in our favor. This balance, instead of being paid by our imports, will have to be paid by Europe in gold. This influx of European gold will result in the expansion of our bank reserves, causing an increase of deposits and money in circulation. The improved financial conditions should mean the use of a large amount of cement in new construction.

Summing up briefly, agricultural prosperity, new markets, high prices of the substitute for cement, and better financial conditions, should mean a prosperous year for the cement manufacturer. This prosperity will become more pronounced, as the indications of good crops become more evident, and, provided we are favored in that respect, the cement industry should be in a thriving condition by next fall.

CEMENT EXPORTS

Belgian cement exports for the first quarter of the present year aggregated 145,683 tons, contrasted with 224,179 tons during the corresponding period of 1913, a decrease of 78,496 tons, or 3.5 per cent. Exports to Argentina showed a particularly heavy decline, amounting to 30,766 tons, compared with 67,944 tons in 1913, a decrease of 37,178 tons, or nearly 55 per cent.

After an idleness of a month, the Bath Portland Cement Co., Bath, Pa., has resumed with a force of 300 men.

CEMENT IN SOUTH AMERICA

It is learned from responsible sources that there is a market in South America and the West Indies which could absorb anywhere from 12,000,000 to 15,000,000 barrels of American cement. Leading trade authorities assert that the outlook depends on how soon the financial situation is adjusted in regard to foreign buyers, and also as to the ability to secure a sufficient number of suitable vessels to transport cement at a fair freight rate.

William Phelps Corbett, a director in the Alsen's American Portland Cement Works, in speaking about conditions surrounding the market for cement, said.

"It is, of course, too much to hope that this great market in South America and the West Indies can be at once obtained by this country because of the drawbacks indicated and the rather poor financial state of some of these countries just now. The European trade has hitherto been supplied by Germany, England and Belgium.

"Just how soon we can materially profit by this great opportunity depends almost solely on the factors of shipping facilities and banking or credit arrangements. Nevertheless, these countries do require and must obtain so staple a commodity as Portland cement, which is practically one of the necessities, and they are not only buying to some extent already, but as their stocks decrease their needs grow more pressing and the deplorable fact obtrudes itself that as the conflagration in Europe is likely to prevent any supplies from that source for perhaps two years or more, they will be ready to make greater efforts to meet American producers half way.

"Unfortunately, they have been educated to long time credits, which Germany especially has so ably fostered and increased their commercial supremacy. This will largely determine the question of prices for next year, and if it were worked out satisfactorily at an early date, there would be every reason to expect a moderate advance in the price of cement next year, because the tremendous increase in cement road construction will assist in taking care of the natural falling off due to the effects of the war on general building construction.

"Cement has proved by all means the most economical and satisfactory material for public roads which will safely withstand automobile traffic, the latter having torn all other moderate price roads, such as macadam, to pieces almost as fast as laid in the last year or two."

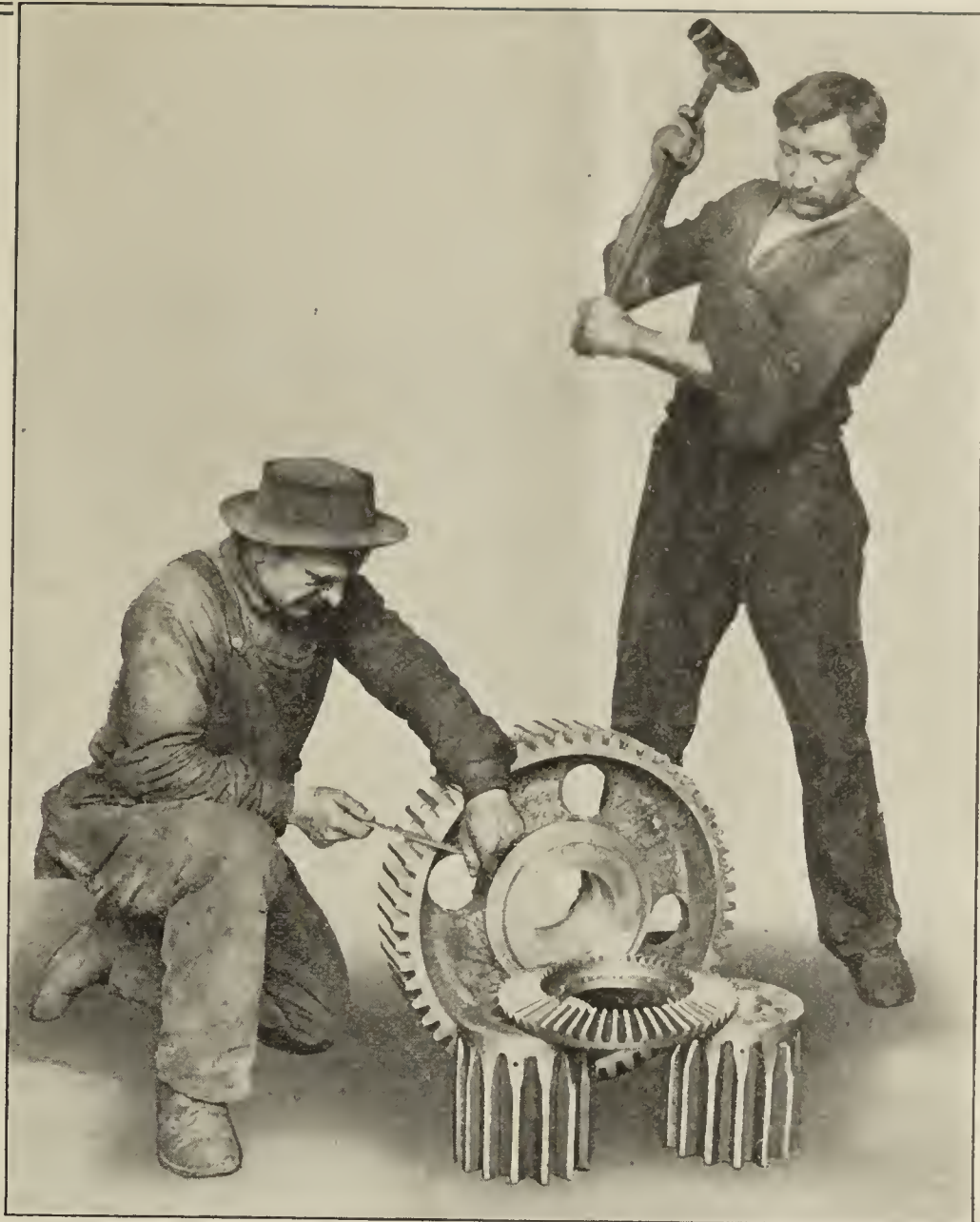
CEMENT FREIGHT RATES

The Interstate Commerce Commission established the principle today in the case of the Oklahoma Portland Cement Company against various western, south-western and southern railroads that "a carrier may not, by rate adjustments, reserve the territory it serves for plants on its own lines."

It was held by the commission that on shipments of cement from Oklahoma to Arkansas destinations there should be a differential of 3 cents under the Kansas gas belt rates and a differential of 2 cents under those rates to destinations in Texas and Louisiana. The Iron Mountain road was required to establish through rates on cement shipments from Ada, Okla., to such destinations as it reaches by through routes from the Kansas gas belt.

Howard E. Reid head chemist for the Lawrence Portland Cement Company of Siegfried, Pa., for the past seventeen years, died.

*Heavy Sledge
Hammer Blows
or a Milled
File Make No
Impression on
"INFUSOED"
Steel Parts . .*



Some of the Things the "INFUSO" Process Does

Increases THREE TIMES the life of gears, pinions, couplings, spindles, shafts, forgings and heavy duty parts of all kinds.

"INFUSOED" ROLLING MILL GEARS GIVE MONTHS OF SERVICE WHERE ORDINARY GEARS LAST ONLY A FEW WEEKS.

Increases tensile strength by 50 to 100%.

Produces the strongest, toughest and most durable steel.

Eliminates all waste in material due to improper treatment.

The "INFUSO" Process Is Not Case Hardening

It is a scientific and practical method of heat treating which in every case renders any steel stronger, tougher and more wear-resisting. It builds up the core of the metal as well as the surface and makes a strong, tough core. It is the result of eight years' experimenting in laboratory and in actual practice.

Let Us Serve You as We Are Serving Many Others

Our corps of experts in the science of commercial heat treating are at your service. THE "INFUSO" PROCESS IS TOO IMPORTANT FOR YOU NOT TO INVESTIGATE FULLY.

THE STEEL IMPROVEMENT CO.

Cleveland

STOP SHOVELING YOUR PROFITS AWAY

The Van Duzen, Roys Company, after an extended experience in the mixer business, have learned that the machine which gives the best general satisfaction is the medium sized batch mixer. Not a little and not a big mixer, therefore, to meet this demand of the contractor, they have brought out the Van Duzen Batch Mixer which has a capacity of 50 to 80 yards per day.

This machine is made of iron and steel throughout and the result is a very rigid and compact outfit. The bowl of the drum has rounded surfaces and this drum revolves on steel ball bearings on chilled surfaces. The location of this bearing is such that none of the sand or grit can work into it. The spindle is hermetically sealed so there is no change of any grit working in on the wearing surfaces.

The drum is operated by a $2\frac{1}{2}$ -horsepower Van Duzen gasoline engine. While this mixer can be operated with a $1\frac{1}{2}$ -horsepower engine, the builders realize the fact that there is always a big advantage in having surplus power.

This mixer is simplicity itself as it is not complicated in any of its parts or mechanism and gives no trouble, and anyone can operate it with ease. By the standardization of their output, namely, the one size only, the builders have effected manufacturing economies which allow them to quote the very closest possible price. It becomes an economy for the large contractor to install three or four of these mixers, as by so doing he can show a much greater working efficiency at a saving in price over one large bulky machine.

Another advantage is, they can concentrate a number of mixers on one job or distribute them to various jobs. The engine is housed in a steel housing; the drum is driven by gears. The wheels run on roller bearings and the machine can be very easily transported from one place to another. They will mail literature to readers of this paper that fully describe their mixers. Address, Van Duzen, Roys Co., fourth floor, Hartman Bldg., Columbus, O.

THE UNIVERSAL GOOD ROADS ROCK CRUSHING OUTFIT

Universal and Eureka Roll Jaw Rock Crushers have been selected for many years by the leading road contractors, State highway commissioners, supervisors, county commissioners, cities, and townships. They are manufactured by the Universal Crusher Company, Cedar Rapids, Iowa, and are built in twenty-two sizes with capacities from 25 to 300 tons per day; and thus the contractor can buy exactly the size of machine he needs. Simplicity, good workmanship, and large capacity for the power use, are some of the superior points of this company's product which are recognized by all. The prices and guarantee seem to give satisfaction. Over two thousand of these machines have been sold during the last four years.

The Universal good roads rock crushing outfit is a great outfit in every way, and the users praise it to the limit. The wide range of different sizes of crushed stone it will produce for the different purposes is not duplicated by any other machine, so it is claimed. If the contractor lacks sand, or if sand is difficult to get, he can crush the rock fine enough for concrete construction work of all kinds. You can produce material for the filling of the roads and for the top coating, and do such work quicker and more economically than with the older types of crushers with which it is necessary to screen the material in order to get the different sizes. Also, with the smaller sizes, you can crush

limestone fine enough for land purposes, and therefore it is the ideal machine for the farmers. It is said that hundreds are in use for this purpose throughout the United States. Write the Universal Crusher Co., Dept. 14, Cedar Rapids, Iowa., for their new folder No. 10.

JEFFREY LIME PULVERIZER.

Information on the value of lime as a producer of nitrogen and as a necessary plant food, and how to grind it on the farm, is contained in Catalogue No. 156, issued by the Jeffrey Manufacturing Company, of Columbus, O. Description and illustrations of the construction of the pulverizer are also given. The Jeffrey Manufacturing Company announces a new catalogue will shortly be issued describing and illustrating its Lime Pulverizer Junior, which is a small machine, one-ton capacity per hour, designed for the individual user. The machine crushes rocks of the size of 3-inch cubes or under, and the hopper, which holds a large wheelbarrow load, may be filled while the pulverizer is running. Rapidly revolving hammers strike the rock in suspension. The rock is fed into the pulverizer by a reciprocating rock feeder, which regulates the flow of the rock into the pulverizer drum. The company states the pulverizer is strictly a one-man machine and requires only an eight-horsepower engine to operate it.

WATERPROOFING PATENT SUIT

The Medusa Concrete Waterproofing Company of Sandusky, Ohio, makers of the Medusa Waterproofing, has brought suit against the Hercules Waterproof Cement Company and Harold C. Hutchinson, of Buffalo, N. Y., in the United States District Court, Western District of New York, on patent No. 851,247, issued to Spencer B. Newberry. Suits against other companies are now pending, including that against the McCormick Waterproof Portland Cement Company, in which decision in favor of the Medusa Company was rendered last summer.

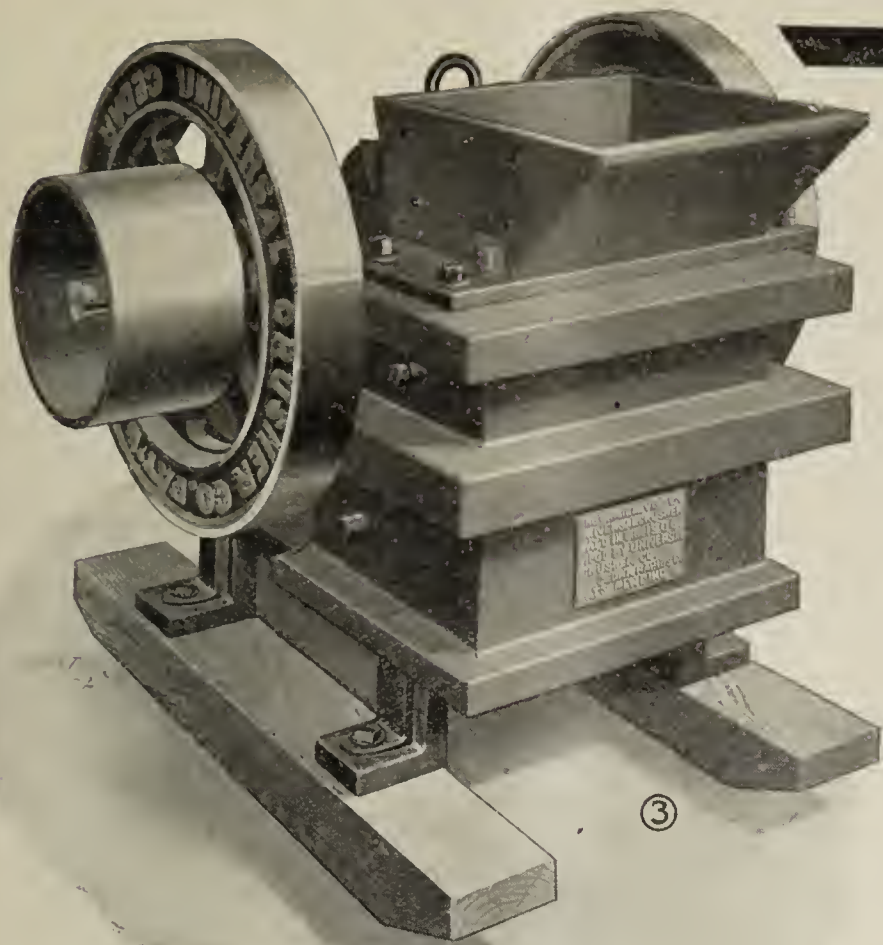
SAND-LIME BRICK

William H. Crume, president of the Crume Brick Company, Dayton, Ohio, was honored with election to the office of president of the International Sand-Lime Brick Association at the eleventh annual session of the association.

Other officers chosen for the ensuing year were G. Silvester, of Calgary, Canada, vice-president; W. H. Terry, of Toronto, secretary; John L. Jackson, of Saginaw, treasurer; and executive committee, L. W. Penfield, of Willoughby, Ohio; W. D. MacFarlane, of Winnipeg, Canada; John E. Maher, of Rochester, N. Y.; W. J. Carmichael, of Plant City, Fla., and E. G. Chapman of Minneapolis.

President-elect Crume read an interesting and instructive paper at the Wednesday morning session of the convention upon "Reduction of Fixed Charges by Capacity Operation." His paper was rendered doubly valuable and lucid because of the fact that the members had paid a visit to the Crume Brick Company plant Tuesday afternoon. "Some of Our Competitors" was the subject of an interesting paper by Mr. Zander of Saginaw, Mich.; "Sand-Lime Brick in Europe," a paper prepared by Mr. Sutcliffe of Leigh, England, a member of the association, was read by Harold D. Robertson, of Toronto. Messrs. Emley and Sanborn, of the United States Bureau of Standards at Pittsburgh, delivered interesting addresses on "Calcium Silicate."

Milwaukee was voted the next convention and a round table was conducted by W. J. Carmichael.



EXCELS all others in ease of operation. In the light of experience the Universal and Eureka Roll Jaw Force Feed Rock Crushers have proven their worth. Every machine can be instantly adjusted so it reduces rock to any size you want. We are the originators manufacturing twenty-two different sizes ranging in capacities from 5 to 300 tons per day, have small crushers for Block and Tile Plants from \$100 up, guaranteed to do the work or money refunded. Crushers can be returned any time to apply on the purchase price for larger machines. Go to the Chicago Cement Show to be held in February. Make our booths 146 and 155 your headquarters or write for folder No. 11.

Universal Crusher Company,
Cedar Rapids, Iowa, U.S.A. Dept. CE.

DEXTER Portland Cement
THE NEW STANDARD

Sole Agents **SAMUEL H. FRENCH & CO.** Philadelphia



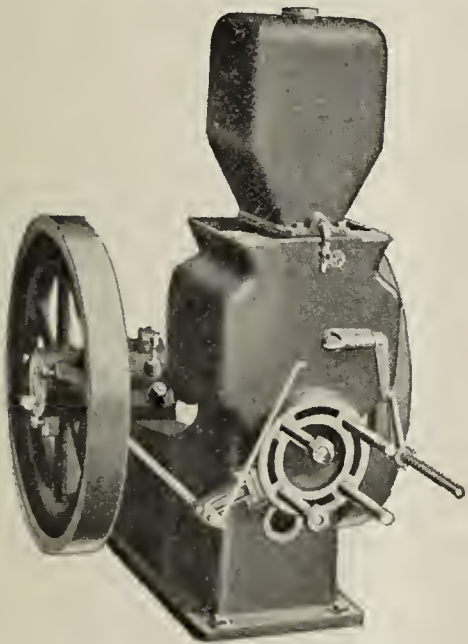
DANIEL B. LUTEN

INDIANAPOLIS

Designing and Consulting Engineer

Reinforced Concrete Bridges Exclusively

Associate Engineers in each State



The Engine with the Troubles Left Out

(4 H. P. Type with Cylinder Head Removed)

We are now prepared to offer you our latest type of KEROSENE ENGINES which have the distinctive features of starting directly on kerosene oil.

No Batteries No Carburetors No Hot Tubes
No Magnetos No Torches No Hot Balls
No Troubles

Users and owners should know about this efficient and fuel-saving engine. Your correspondence is solicited.

The A. M. Castle Engineering Co., Inc.

327 Fay St., - La Crosse, Wis.



The Commonwealth Power Co. tunnel under Grand Ave., Milwaukee, Wis., recently successfully waterproofed with

"Hydrite"

COLORLESS WATERPROOFING

Hourly Leakage 5200 Gallons STOPPED! 700 ft. Concrete Tunnel 55 feet below datum was made watertight.

The success of our method eliminated the necessity of pumps and SAVED \$80.00 to \$100.00 PER MONTH.

In addition to the possibility of damage to the cables, etc., from the seepage. This tunnel, 10 years old, has been free from leakage for nine months, or since work was completed. We guarantee it to stay so.

HAVE YOU A WATERPROOFING PROBLEM?

Difficult waterproofing problems in NEW or OLD work can be economically and successfully solved. The experience of a successful organization is at your service and satisfactory results are guaranteed.

Our method of applying grout, internally or externally, under heavy pressure through pipes, or upon the surface, as the conditions require, is applicable to tunnels, reservoirs, foundations, basements, etc., of masonry or concrete construction. Leaks are not only stopped but the structures are strengthened.

Let us help you with your waterproofing problem. Write us concerning our product and methods. Ask for descriptive booklet.

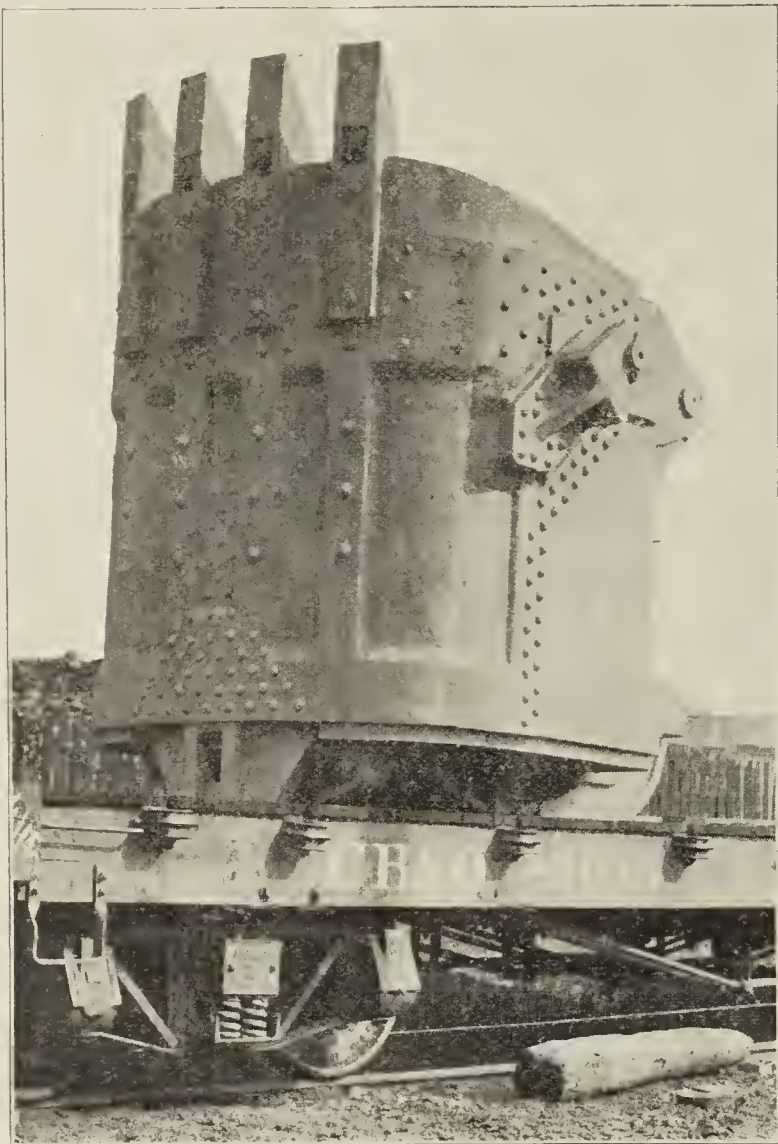
WATERPROOFING COMPANY OF AMERICA
MILWAUKEE, WIS.

Branch Offices:
543 McCormick Building, Chicago. Callahan Bank Building, Dayton, Ohio.
1014 Transportation Building, Montreal, Canada.

TWO TEN-YARD DIPPERS

Two 10-yd. dippers of manganese steel, weighing approximately 37,600 lb. each, were purchased recently by the U. S. Government, to be used on the dipper dredges Paraiso and Gamboa, which are operating at the Panama Canal. These are the largest manganese dippers made to date and are of the so-called Missabe type, patented and manufactured by the Edgar Allen American Manganese Steel Company for the Bucyrus Company.

Manganese steel is used throughout, except for bolts, nuts and rivets. The over-all dimensions are 10.5 x 9 x 9 ft. The lips are 3¼ in. thick; the fronts are 3¼ in. thick underneath the teeth, 1½ in. between the teeth and 3¼



10 Cubic Yard Missabe Dipper.

in. at the bottom band; and the backs are 1¼ in. thick at the sides and 3¼ in. at the bottom bands. In the photograph it will be noted that there are few rivets as compared with a dipper of the built-up type.

The body consists of the front and back castings. The lap joints at the sides make the dipper rigid and relieve the rivets from strain. The bail brackets are attached to the front casting at an angle conforming to the line of pull on the bail, which throws the strain of the pull directly on the front casting. Shoulders or offsets to relieve the strain on rivets are provided throughout.

SAND AND GRAVEL PLANT

The Greenville Gravel Company of Greenville, Ohio, has four gravel plants, two at Greenville, Ohio, one at Mechanicsburgh, Ohio, and one at Ackerson Lake, Mich. They have three Marion steam shovels and one Shearer & Mayer drag line cableway excavator for dragging and loading the gravel and they operate 8 Morris centrifugal pumps, which give splendid service. They operate three No. 6 and one No. 4 McCully crushers, furnished by Power & Mining Machinery Company.

LEHIGH CAR, WHEEL & AXLE WORKS

Catalogue No. 50 of the Lehigh Car, Wheel & Axle Works of Catasauqua, Pa., describes and illustrates their various products of charcoal iron castings which are well-known to be especially adapted for service requiring great strength and durability or in cases in which they have to be subjected to severe abrasion, as for instance in crushing and pulverizing cement raw materials.

Sprocket Wheels with specially hardened and treated teeth, Clutches of every description, Gears, Ring Gears for the largest size rotary kilns or tube mills, Tube Mill Linings and Wearing Plates, Kent Mill Rings and Rolls, Griffin Mill Rolls, Jaw Crusher Plates and Gyratory Crusher Cone Heads, briefly all wearing parts of power transmitting, grinding and crushing machinery used in cement plants are furnished by this company who has established a reputation among cement manufacturers for their durable steel castings.

Last, not least, the Fuller-Lehigh Pulverizer Mill is described and illustrated, which has rapidly found its way into modern cement plants on account of economy and efficiency. It produces a finished product in one operation.

ERIE PUMP & EQUIPMENT CO.

The Erie Pump & Engine Works of Erie, Pa., whose sand gravel dredging pumps and general contractors' pumps have been well known to the trade for the past twenty years, advise of a change in their organization. This concern has recently been consolidated with the Northern Equipment Co., also of Erie, who are manufacturers of the Copes Boiler Feed Water Regulators and Governors. The name of the combination is the Erie Pump & Equipment Co., and they will occupy the property of the Erie Pump & Engine Works, which is located in the heart of the city, close to all railroads, so that the best shipping facilities are available.

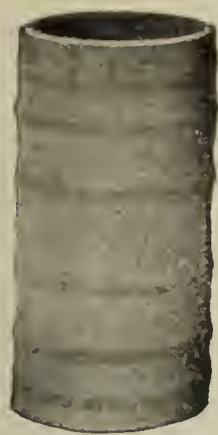
The new company wishes to make known to the public that Mr. John G. Pfadt, who was president of the Erie Pump & Engine Works, is not connected in any way with the new concern. Mr. John H. Dougherty, who for a number of years has been in the employ of the Jeansville Iron Works as designer of centrifugal pumps, has been engaged to take charge of the designing of pumps for the new company.

The officers of the Erie Pump & Equipment Co. are: E. W. Nick, president and treasurer; D. H. Du Mond, vice-president; V. V. Veenschoten, secretary.

TRADE LITERATURE

The Link-Belt Co., Chicago, Ill., has issued Book No. 124 pertaining to "Link-Belt Steel Chains and Sprocket Wheels." The booklet contains 42 pages of descriptive matter, tables, diagrams, etc., and is amply illustrated.

The Power & Mining Machinery Co., Cudahy (a suburb of Milwaukee), Wis., has issued Bulletin No. 42 pertaining to crushing rolls. Clear and concise descriptive matter, with suitable illustrations, are contained in the booklet under the subjects of Crushing Rolls, The Superior Crushing Rolls, Crushing Rolls Capacity and Horsepower of Crushing Rolls, Hercules Rolls, Simplex Crushing Rolls, Feeders for Rolls and Sectional Rolls for Mule Back Transportation. Outline drawings of Superior crushing rolls are also shown.



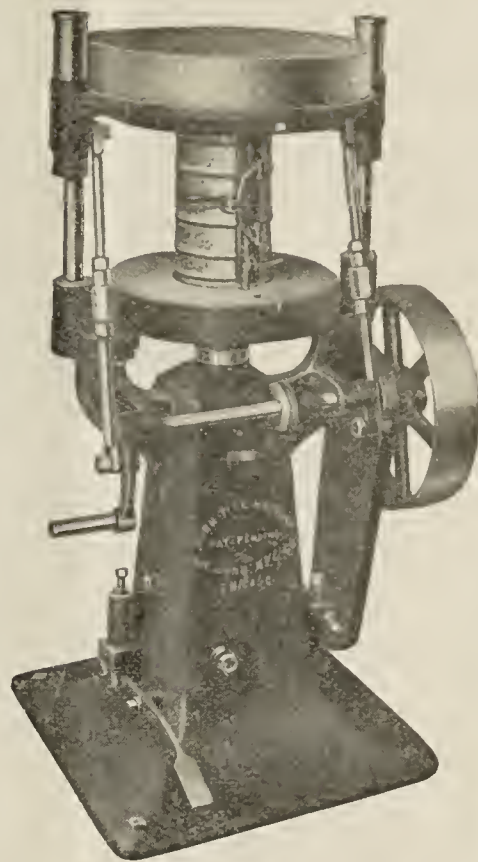
Make \$230 to \$800 a month in the Cement Drain Tile Business

This profit is conservatively figured—and *guaranteed*. You have no good reason for passing up this business! We will establish you on a sound footing. We will send you a blue-print of a suitable tile plant, and give you the exact cost of equipment for producing various sized tile. This is free upon request.

We show you how to make the tile and how to establish a market. We furnish the kind of co-operation that assures you success.

The Dunn No. 1 Tile Machine, as shown in illustration, and Dunn standard equipment, makes your investment comparatively small. And you are given *15 days' trial* on whatever machinery you desire.

Investigate this proposition by writing for complete information *today*.



15 DAYS' TRIAL

Pay us for Dunn Machinery when you are *satisfied* with it; that is what our *15 day free trial offer* means to you!

The privilege is the same on large or small orders; it means that *merit* is the selling factor of Dunn Equipment.

Cement Block Machine —\$40 complete

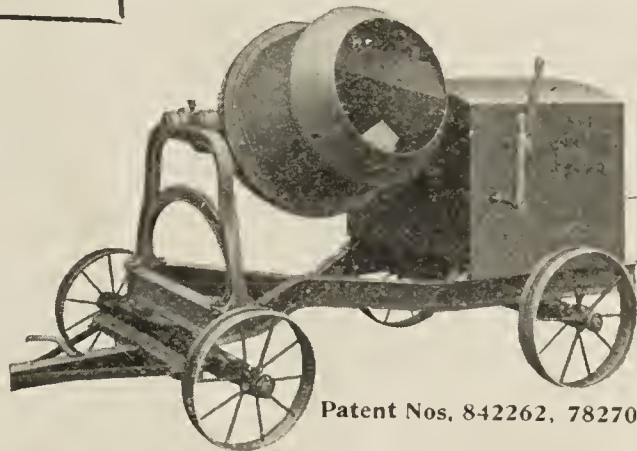
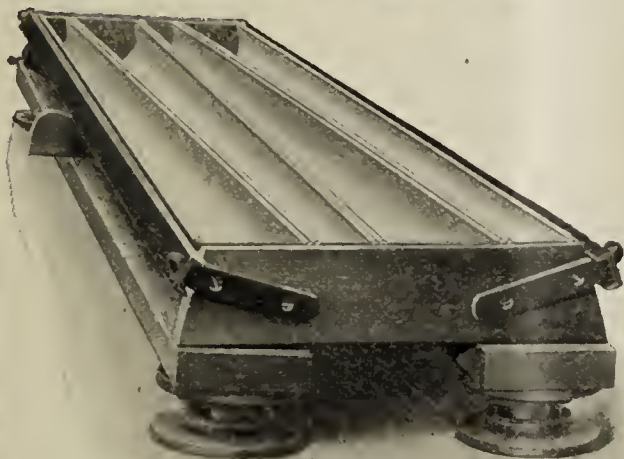
This small investment buys equipment for making Face Down, Side Face and Two-Piece Hollow Wall Cement Blocks. For the Dunn machine makes all three styles.

Has a daily capacity of 150 blocks; has a special off-bearing which eliminates chances of breakage; lessens labor of tamping. Sold on *15 days' trial*; block machine catalog sent free.



Fence Posts that Satisfy

—are those made on *Dunn Concrete Fence Post Molds*. We explain how easy they are to make—and to *sell*—in the post mold catalog; write for it. Price of 4-mold battery, \$12.50—on *15 days' trial*.



Patent Nos. 842262, 782700

Concrete Mixers —prices from \$67.50

Why a Dunn Mixer instead of any other? Because the mixing principle assures a better product; because durability and reliability are more pronounced; because they *save labor*.

Styles and sizes costing from \$67.50 to \$224 fully described in Mixer catalog; get a copy. Sold on *15 days' trial*.

Pour Your Sewer Pipe

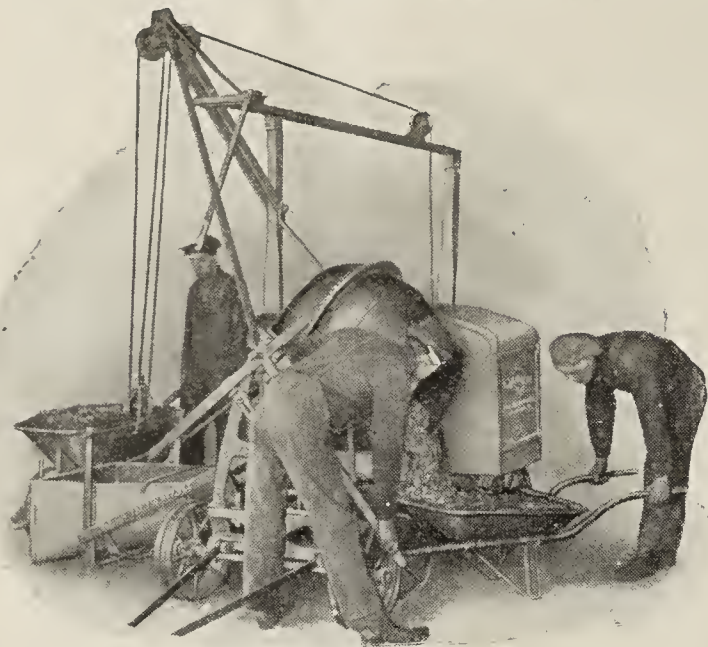
Quit tamping a semi-dry mixture—*pour* a *wet* mixture into *Dunn Molds* to make any size of drain tile or sewer pipe from 6 to 36 inches in diameter. This method saves labor and expense and makes a *better product*. Price of 12 inch mold, \$7.50—on *15 days' trial*. Write for catalog.



W. E. Dunn Mfg. Co.
4139 Fillmore St.,
Chicago



Stop Shoveling Your Profits Away



Get the Time-Saving, Substantial, Reliable, Economical Van Duzen Mixer, with or without side loader, used by hundreds of large and small contractors. Capacity 50 to 80 yards per day. Both the Price and Cost of Operation will surprise you.

Manufactured under Basic. U. S. Letters Patent
Jan. 24-05, Feb. 14-05, Jan. 29-07.

Our catalog fully describes these machines

The Van Duzen-Roys Co.

4th Floor, Hartman Bldg., Columbus, O.



HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs—no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our No. 38 Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

H. W. CALDWELL & SON CO.

17th Street and Western Ave., CHICAGO

NEW YORK, Fulton Bldg., Hudson Terminal, 50 Church St.

Henry Heil Chemical Company

210 to 214 South Fourth Street, ST. LOUIS, MO.

We make a specialty of
supplying cement works with

Chemical Apparatus, Chemicals and Reagents

Gilmore's Needles, Cement Moulds, Vicat Apparatus,
Schumann's, LeChatelier's and Jackson's
Specific Gravity Apparatus, Etc.

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A simple, rapid, efficient, economical machine for excavating sand and gravel from wet or dry pits and delivering to screens, bins, cars or storage piles.

It digs, conveys, elevates and dumps in one continuous forward operation. The speed of the dump is under Positive Control of one operator.

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It Is Your Privilege to Test the U. S. STANDARD CONCRETE MIXER Before You Buy

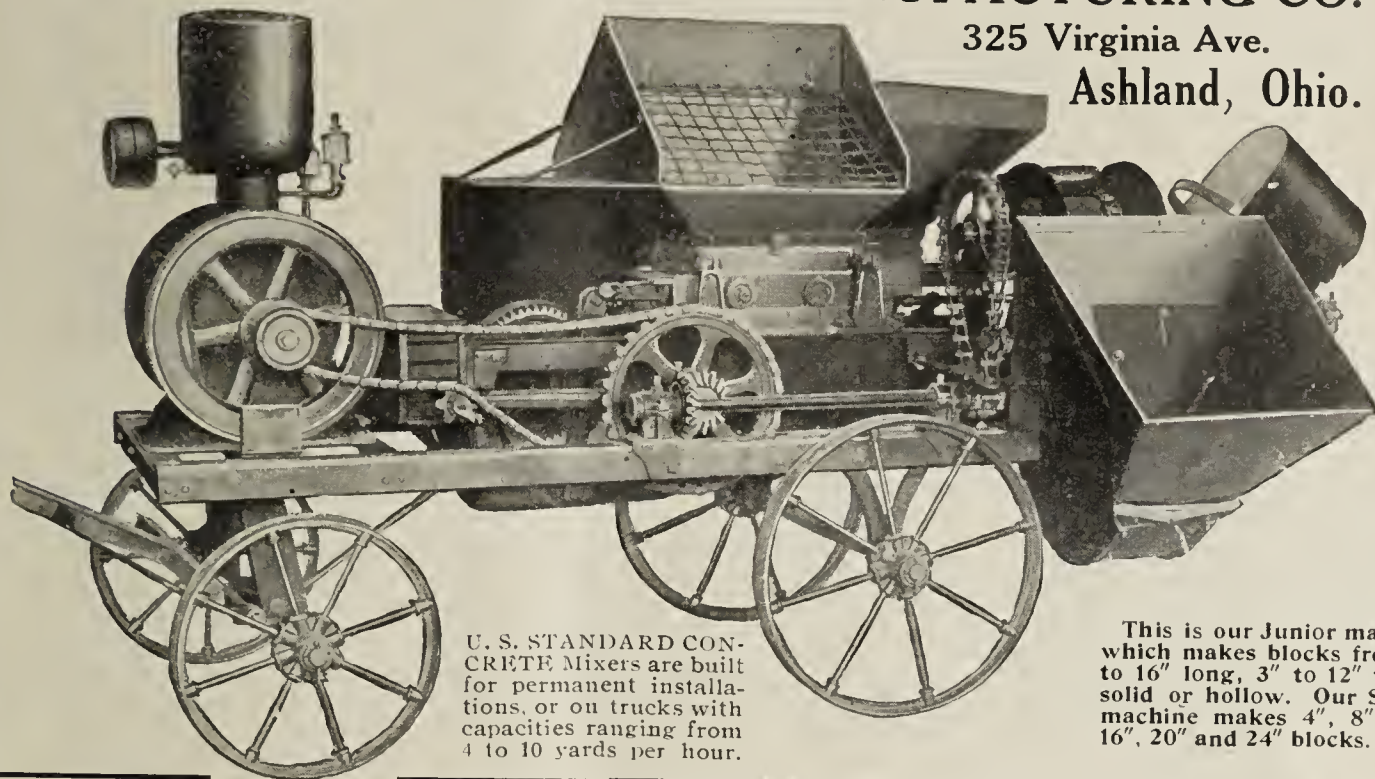
The U. S. STANDARD CONCRETE MIXER is a continuous mixer with a positive measuring, proportioning and feeding device which makes it more accurate than any batch mixer ever made, because it does not depend upon the brain of the operator. It will stand the hardest tests put to it. There are no weak parts in it to cause break-downs, or defective operating parts to cause delay. All parts are interchangeable; workmanship the best. Warranted to embody the most practical and up-to-date working principles. Simple operations change the adjustments to suit any worker. Is giving excellent satisfaction to users. All we ask is a chance to have you try our mixer. We will operate the mixer to your satisfaction on the job, or no sale.

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325 Virginia Ave.

Ashland, Ohio.



U. S. STANDARD CON-
CRETE Mixers are built
for permanent installa-
tions, or on trucks with
capacities ranging from
4 to 10 yards per hour.

We also manufacture the famous U. S. STANDARD Block Machine. Turns out solid or veneer blocks, as well as hollow blocks with oval air spaces. It is built in two sizes, and is so designed that it handles wet mixture perfectly, resulting in a block of unusual density and strength. For speed they cannot be surpassed.



This is our Junior machine which makes blocks from 4" to 16" long, 3" to 12" thick, solid or hollow. Our Senior machine makes 4", 8", 12", 16", 20" and 24" blocks.

1915 Mixer Sensation

5 Ft.
Cap.

On Steel Trucks-3 H.P. Engine
Steel Housing-Low Barrow Hopper

Has steel housing, low barrow hopper. Can also be equipped with measuring hopper, power loader and automatic water tank.

It's a mixer that meets every possible requirement on every-day jobs. Sturdy, but light in weight. An investment that will pay dividends every day it's used. Nothing like it for the price ever offered. Better than most of the mixers that cost one or two hundred dollars more. Read specifications and description below.

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SPEED QUALITY
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Has steel trucks. Runs in wagon tracks. Substantial drum with mix and remixing action like the large \$2,000 paver. 3 Horse Power engine. Fast discharge. Has low barrow hopper. Steel housing over engine. Exceptionally good for county or township work, for silo builders and general contractors. Sold on 5 days' trial. Money back if it fails to come up to all claims. No quibbling or argument.

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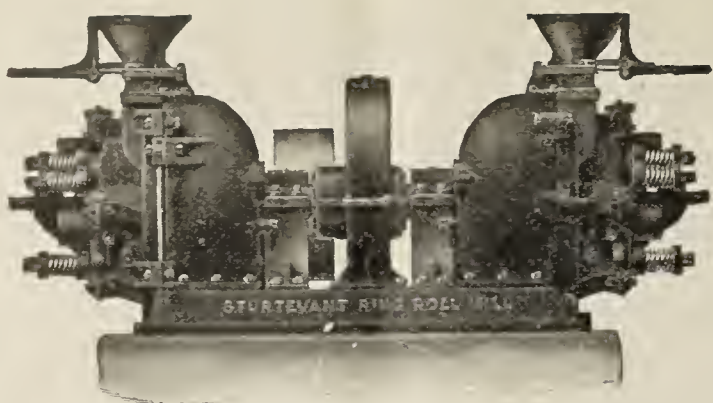
If you want a hand mixer that can also be used on belt, a mixer that's cheap but good, ask about our Packard Hand Mixer. Address,

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THE LARGEST PRELIMINARY GRINDER BUILT

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80 TO 120	BBLS. TO 20	MESH WITH	80 — 90	H. P.	
50 " 80	" " 40	" " "	80 — 90	H. P.	
50 " 60	" " 80	" " "	80 — 90	H. P.	
UPKEEP APPROX. $\frac{1}{10}$ c. PER BBL.					

UPKEEP APPROX. 10c. PER BBL.

The Ring-Roll Tube Mill Unit can produce cheaper cement from every standpoint — upkeep capacity, low power and continuous operation than any other. Ask the users, they can prove it to you, and we can.

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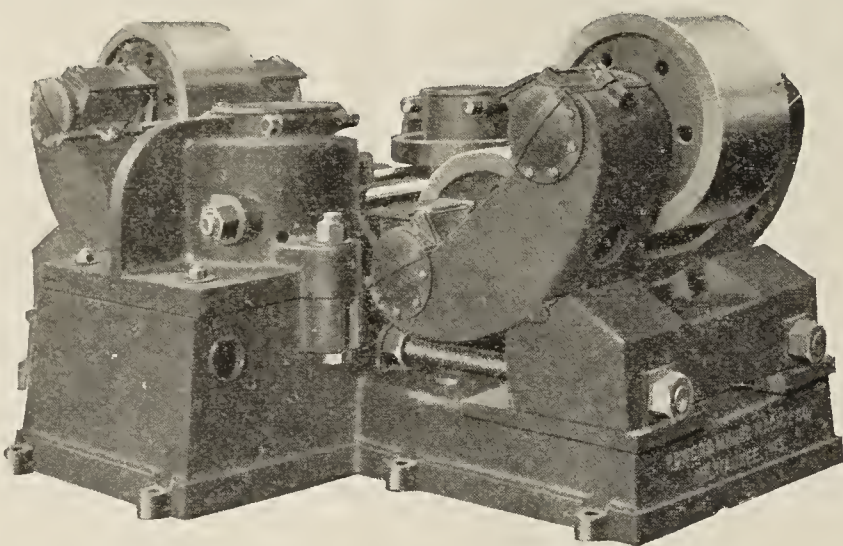
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Vulcan Rotary Cement Kiln

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Cement Mill Machinery
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ARE you the best—not necessarily the biggest—concrete or cement man in your neighborhood?

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UNDERTAKERS everywhere are waking up to the fearful crudeness of the old fashioned method of burying unprotected in

the muddy bottom of a six-foot cistern. As soon as the public begins to realize there is something better—and we shall see that they begin to before long—the holders of the Norwalk Vault franchise for any given district will have a mighty valuable possession.

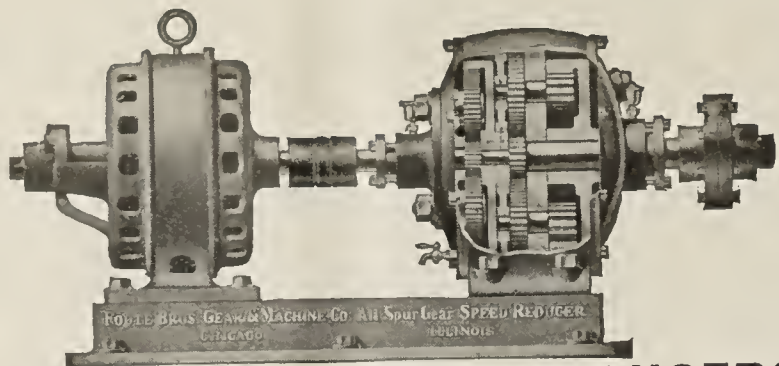
FOR the value of each Norwalk territory increases greatly every time a new and hitherto unoccupied territory elsewhere is filled by the right man. And we are filling them very rapidly—only 5 more counties left in the whole of New York State for instance. Yet these territories still unoccupied may be had by the **right man** at a cash outlay astonishingly disproportionate to the possibilities of the investment.

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ON the other hand, this is no get-rich-quick game. To make a success a man must have a little capital and be willing to work hard to build up the business. For the right kind of man, however, there is a very real opportunity; no technical experience is necessary; no expensive factory; no big payroll; no fancy expenses of any kind.

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Norwalk Vault Company 38 Seminary Street
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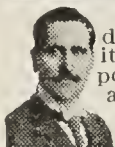
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Note they are dust proof, compact, made in any horse power or reduction. Just what is needed on conveyors, elevators and reduction of speed anywhere. **We manufacture cut gears.** Send for catalogue.

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The New Galloway Masterpiece "Six" is the most down-to-the-minute engine that mechanical ingenuity can produce. It is perfectly adapted to furnish power to the shop, the mill, the contractor anywhere and where ready, steady, reliable, efficient and economical power is needed.

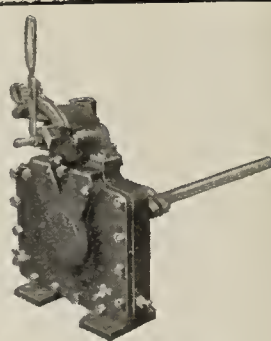
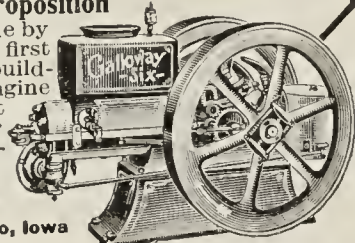
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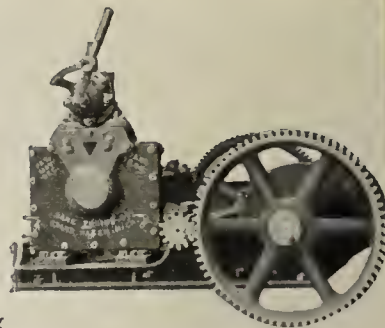


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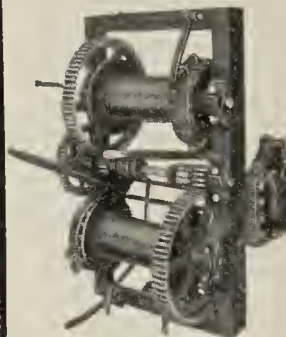
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Grand Haven,
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U. S. A.

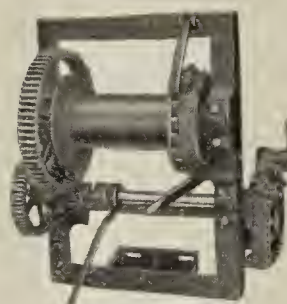
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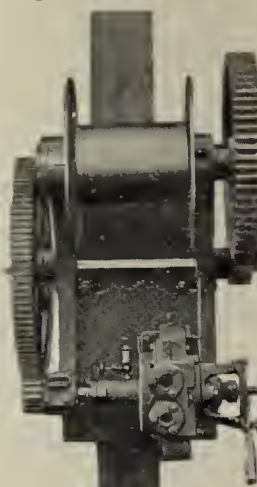
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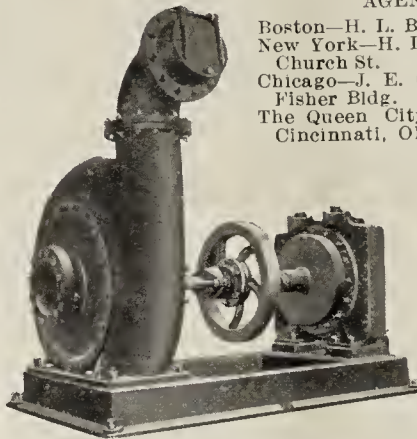
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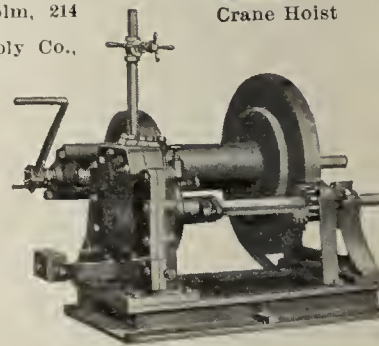
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Direct-Connected Centrifugal Pump



Single Drum Friction Hoist

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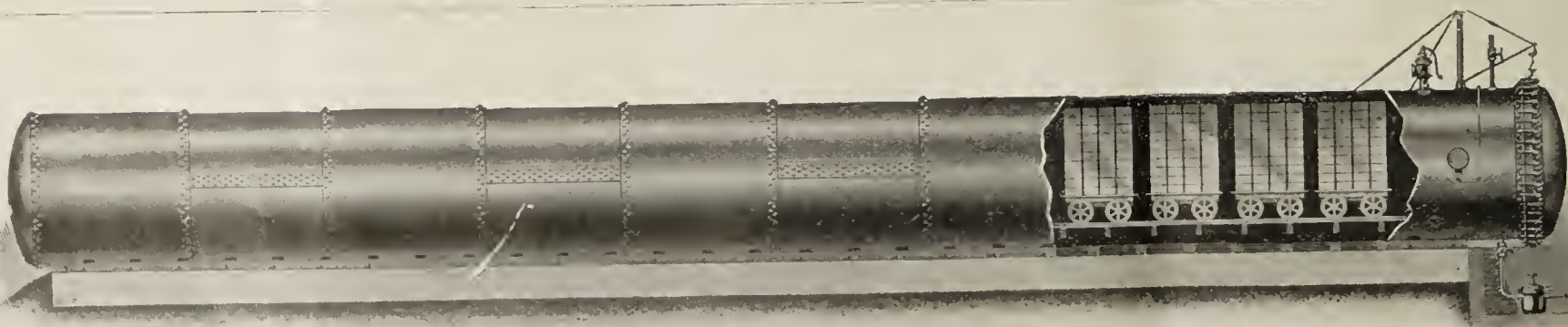
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Send for this latest book by Cecil H. Desch
It is the first comprehensive review, written in
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RESULTS:—Increased Efficiency—Saving in Operating Cost.

We manufacture all kinds of wearing parts subjected to abrasion.

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"The Dust in Cement Works"



This Interesting Booklet Will Be
Sent Free Upon Request

Why It Should and How It Can Be
Removed and Collected

CONTENTS

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Coal Dryers

Rotary Kilns

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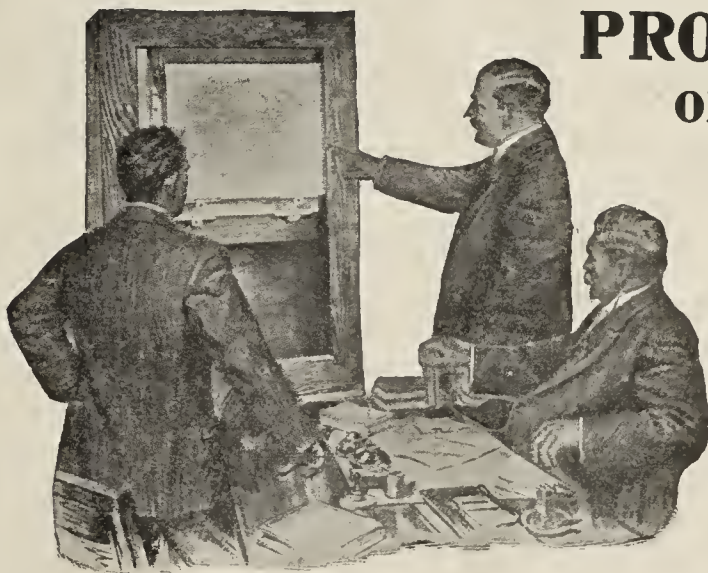
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This Superintendent and Chemist can show the
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without leaving the office.

They use Recording TWINKO Pyrometers and
have an absolute check on the Kilns Night and
Day. What has helped them will help you.

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INVESTIGATION AND EXPERIENCE ARE PROVING THE RELIABILITY OF HYDRATED LIME FOR WATER PROOFING CONCRETE WORK. IT IS NOT ONLY THE BEST BUT THE CHEAPEST WATER PROOFING COMPOUND KNOWN.

Architects, Engineers and Contractors everywhere are being interested in and are investigating the worth of Hydrated Lime as a water proofing. Experience and actual application are proving to them beyond shadow of doubt that Hydrated Lime is reliable, permanent and harmless.

Concrete Tank for Smudge-Pot Distillate in California Reservoir Oil-Proofed by Adding 10 Per Cent of Hydrated Lime to Concrete.

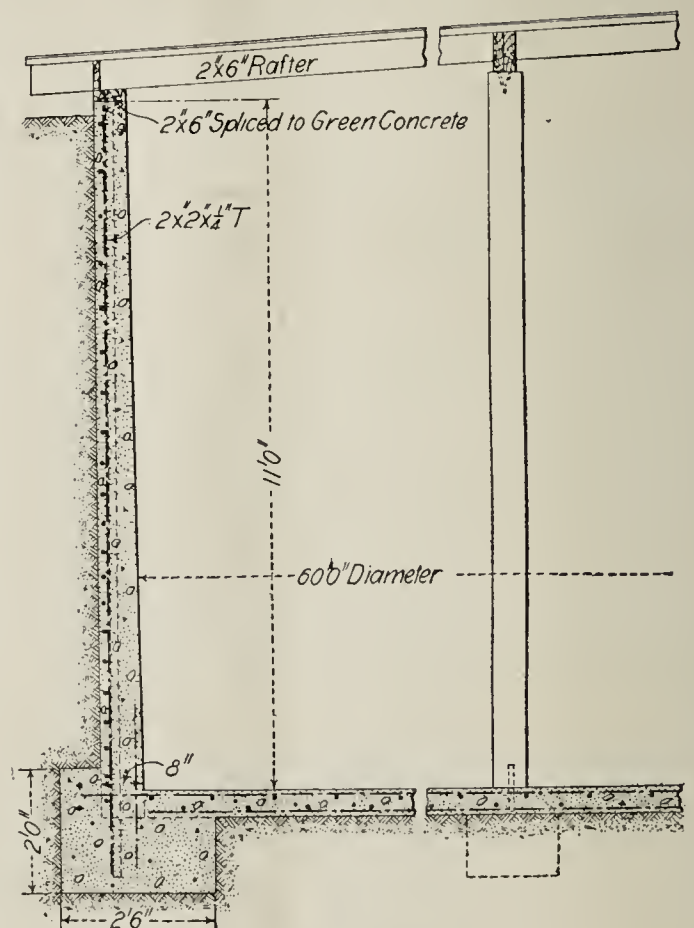
ABSOLUTE assurance of having material on hand for smudging in the citrus belt of Southern California, when a falling temperature requires this measure, has led to the storage on the ground of "slop distillate," a local name for the low grade oil used in the smudge pots. Many supplies for the individual grower are handled by the association which packs and sells his output. At Narod the West Ontario Citrus Association has recently constructed a reinforced-concrete distillate reservoir of 235,000-gal. capacity, sufficient to carry the orchards over the low-temperature period. It is 60 ft. in diameter and 11 ft. deep.

Many attempts have been made with varying degrees of success in building reservoirs of concrete which would be impervious to oil, as even the heavy grades of crude oil will permeate walls which are watertight, but the lighter grades of oil and distillate are harder to confine. The engineers report that the Narod tank has been filled with distillate for more than six months without any evidence of seepage.

A section of the wall is shown herewith. Eight 6x6-in. redwood posts, 15 ft. from the center post, support the composition roof laid on top of $\frac{1}{2}$ -in. sheathing.

The floor is reinforced top and bottom with $\frac{1}{2}$ -in. rods spaced on 12-in. centers both ways. The concrete block under the wall extends 8 in. beyond the outer edge of the wall and has a rim against which the 8-in. non-battered wall abuts. Horizontal wall joints at the end of a day's run consisted of a bond of No. 27 galvanized iron sheet 6-in. wide, embedded half its width in each day's work.

Oil-proofing was accomplished by adding 10 per cent of hydrated lime to the concrete during the mixing operation. Mayberry & Parker, architectural engineers, of Los Angeles, designed the tank, which was built by L. Fleming of Pomona, Cal.



SECTION THROUGH WALL OF NAROD TANK

See next page for list of lime manufacturers who make hydrated lime and who will gladly furnish you samples, circulars and any information you desire.

Hydrated Lime on the Panama Canal

Every trowelful of cement mortar used by the United States Government in laying up masonry on buildings on the Panama Canal has been made more plastic, more dense and more water-resistant by the addition of Hydrated Lime. The brick, concrete block and structural tile used in erecting the many important Government buildings in the Canal Zone are all laid in mortar under the following specifications of the War Department:

"MORTAR:—All brick work is to be made of 10 pounds of Hydrated Lime to cement and three parts sand, with the mortar composed of one part each bag of cement used. The materials are to be thoroughly mixed dry and wet to the proper consistency immediately before using. No retempering will be allowed."

The addition of 10% of Hydrated Lime to the Portland cement used in brick mortar gives to the mortar an extraordinary adhesive quality. United States Government Engineer L. C. Sabin conducted a series of tests which indicated that the Hydrated Lime in the mortar retains the moisture longer than cement alone, thus retarding the setting and enabling the mortar to penetrate deeper into the brick, block or tile and gain a stronger grip.

Hydrated Lime is simply commercial lime scientifically slaked in the process of manufacture. It is shipped to you in 40 lb. paper bags or 100 lb. cloth bags, and there is no fire risk connected with its storage.

Hydrated Lime is used to make concrete, in various forms, more dense, and, therefore, more nearly waterproof. It lightens the color of concrete. It makes cement mortar more adhesive and more plastic, and is, therefore, extensively used in stucco work.

Full detailed information of the methods and cost of using Hydrated Lime may be secured from any of the following competing manufacturers of Hydrated Lime:

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Marblehead Lime Co.,
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Ohio & Western Lime Co.,
Huntington, Ind.

Security Cement & Lime Co.,
Hagerstown, Md.

Lee Lime Co.,
Lee, Mass.

Charlevoix Rock Product Co.,
Charlevoix, Mich.

White Marble Lime Co.,
Manistique, Mich.

Glencoe Lime & Cement Co.,
St. Louis, Mo.

Dutchess County Lime Co.,
Dover Plains, N. Y.

Rockland & Rockport Lime Co.,
101 Park Ave., New York, N. Y.

Charles Warner Co.,
103 Park Ave., New York, N. Y.

Kelley Island Lime & Transport Co.,
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Woodville Lime & Cement Co.,
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POSITION WANTED

as Chief Chemist or Asst. Supt. by graduate chemical engineer; have worked six years in all departments of cement mill,—with present employers 3 years as Chief Chemist. Address H. F., care Cement & Eng. News, 1117 Schiller Bldg., Chicago, Ill.

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A fine opening for a man with moderate capital to engage in the general concrete business right beside the largest pile of sand and gravel in Illinois. Free land and free switch. For further particulars address S. W., care Cement & Eng. News, Schiller Bldg., Chicago, Ill.

WANTED.

A large body of sand and gravel containing from 5,000,000 cubic yards and up. Must be free from clay and located on water transportation. Prefer it to be located in Illinois, Missouri, Ohio, Tennessee, Kentucky or Indiana, either on Mississippi, Missouri or Ohio rivers, or some navigable stream not very far from railroad. Address C. C. Walton, Jr., 504 Mutual Bldg., Richmond, Va.

WANTED.

Second hand Kent mills. Marsh Co., Old Colony Bldg., City.

Wanted to hear from owner of good cement plant. Send cash price and particulars. D. F. Bush, Minneapolis, Minn.

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**Two Second-Hand
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**Fully Equipped,
In Excellent Condition**

**Security Cement & Lime Co.
Hagerstown, Md.**

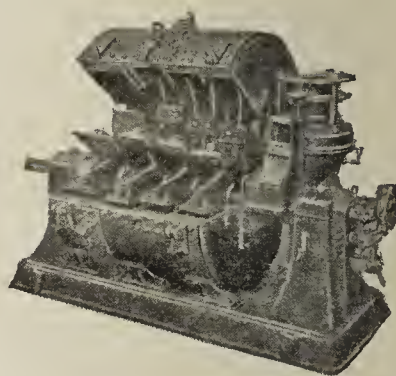
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BECAUSE

1. It gets every available B. T. U. out of the coal.
2. Makes available slack coal and screenings at a fraction of the cost of mine run and lump coal and oil.
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**The Chain that put the SHOVE
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Spur Gear Reductions made in any horse power and any reduction

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Gear & M. Co.
210 to 220 N. Carpenter St.
Chicago



8TH Chicago Cement Show

Coliseum February 10-17, 1915

The Universal Portland Cement Co. will demonstrate good practice in concrete construction; logic of bulk cement—the permanence of concrete—the economy of

concrete roads and pavements. Specimens of concrete from Rome, Pompeii and Panama will prove the slogan

Concrete for Permanence

Visits to Cement Plant

Universal invites you to visit its plants near Chicago. Parties will leave twice daily. Get schedule and passes from any company representative.

How to Reach the Coliseum

From the Illinois Central R. R. depot walk one block west to Wabash Avenue and south on Wabash to the Coliseum. From all other depots walk or ride east to Wabash Avenue and take any south bound car to the door.

UNIVERSAL PORTLAND CEMENT CO.

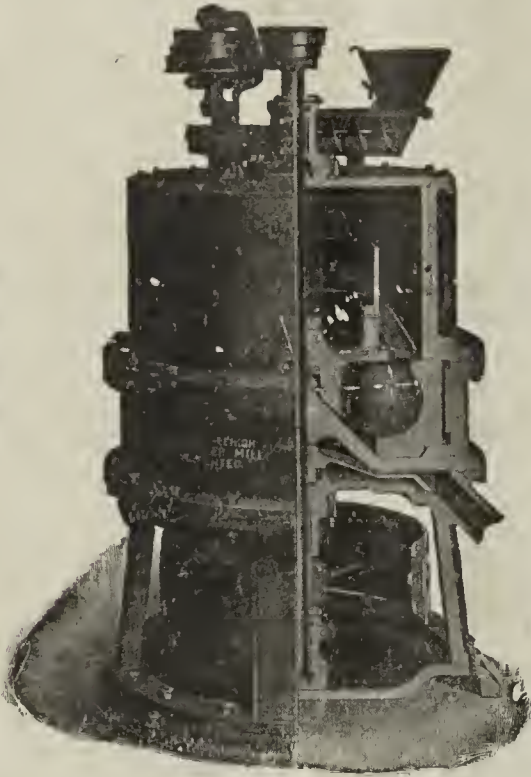
208 South La Salle Street, Chicago

Telephone Wabash 6160

Frick Building, Pittsburgh - - Security Bank Building, Minneapolis

Annual Output 12,000,000 Barrels Plants at Chicago and Pittsburgh

The Fuller-Lehigh Pulverizer Mill.



Produces Commercially

Cement having a higher percentage of Impalpable Powder than can be obtained by any other mill. Tests show that the tensile strength of a 1-5 mortar made with cement pulverized by the Fuller Mill is higher than the tensile strength of a 1-3 mortar made with cement pulverized to the fineness required by the Standard Specifications.

Lehigh Car, Wheel & Axle Works

Main Office: Catasauqua, Pa.

New York
N. Y.

Hamburg
Germany

Cement Companies
equipped with
Fuller Mills
advertise the fact that
The consumer
gets
38 pounds more
of the
Impalpable Powder
or
Real Cement
in every barrel of
cement produced by
The Fuller Mill
than by any other.



"OLD RELIABLE" "XX"—Our Motto is "QUALITY FIRST"

You may buy some cheaper grades of Shovel Chain than "XX" but our High Grade "XX" Chain is always cheaper in the end. Send for catalogue and prices.

"OLD RELIABLE"
"XX" SHOVEL CHAIN

Some manufacturers make several grades of so-called Shovel Chain. We make one grade.

Made only by THE HAYDEN-CORBETT CHAIN CO.,

Columbus, Ohio



WHY DU PONT DETONATORS

Increase the Efficiency of EXPLOSIVES

THEY are made of materials selected by experts having a wide practical knowledge of explosives and their detonation. These

experts constantly inspect and test DU PONT DETONATORS to be assured that they are of standard strength and greatest efficiency.

EXPLOSIVES are dependent on complete detonation for the maximum of execution in tunnel, trench or quarry.

WHY risk the loss of labor, charge and possible misfire by attempting to detonate explosives with weak blasting caps or electric blasting caps?

INSIST THAT YOUR BLASTING CREWS
USE DU PONT NO. 6, 7 OR 8 DETONATORS

Du Pont Powder Company

ESTABLISHED 1802

WILMINGTON

DELAWARE

CEMENT AND ENGINEERING NEWS

Vol. 27

SCHILLER BUILDING, CHICAGO, FEBRUARY, 1915

No. 2

F. L. SMIDTH & CO.

ENGINEERS

50 CHURCH STREET

NEW YORK CITY

Designers, Equippers and Builders of
Portland-Cement-Making Factories



THE STANDARD PAINT CO.

NEW YORK

BOSTON

CHICAGO

Send a Postal Today for Book 82

STUCCO

made with

IMPERVITE

IS Waterproof &
NON-CRACKING

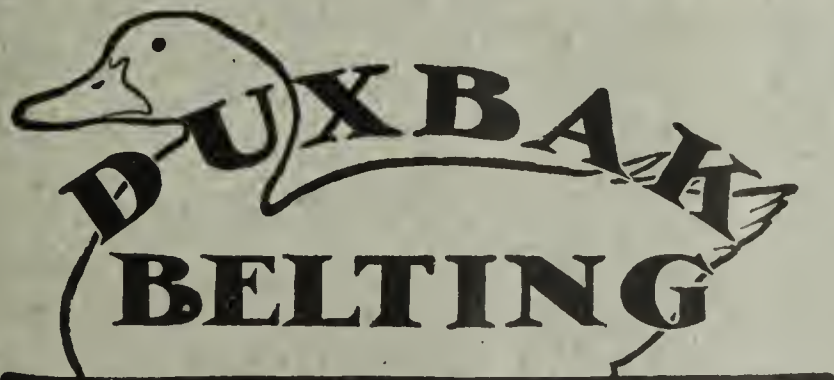
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Grinding
Machinery

THOS. PROSSER & SON

24 Platt St., NEW YORK

Old Colony Bldg., CHICAGO



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ESTABLISHED 1868.

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Belt Makers

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30-38 Ferry St.

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641-643 Atlantic Ave.

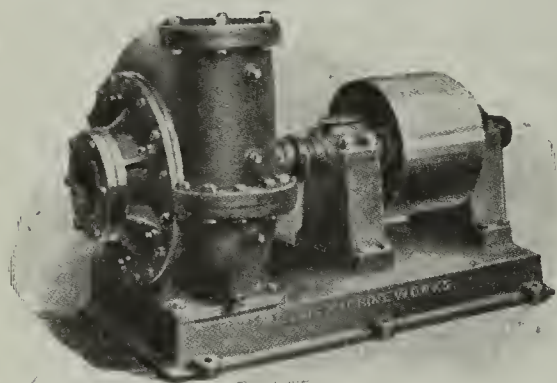
PHILADELPHIA
226 North 3rd St.

The Texas Chas. A. Schieren Co., Inc., 106 S. Market St., Dallas, Texas

MORRIS

Solid Lined

Dredging Pumps



EVERYTHING that enters into the construction of the Morris Solid Lined Dredging Pump is of heavy proportions and the general design is such that wear is reduced to the smallest possible extent. Its ability to outlast other dredging pumps is its chief claim to economy.

By removing the upper half of the pump shell, the lining can be taken out or by removing the disc on the pump shell and the inner disc on the lining, the runner can be taken out. The pump is easily and quickly taken apart if necessary to replace lining or piston.

*Write for Sand and
Gravel Pump Catalog*

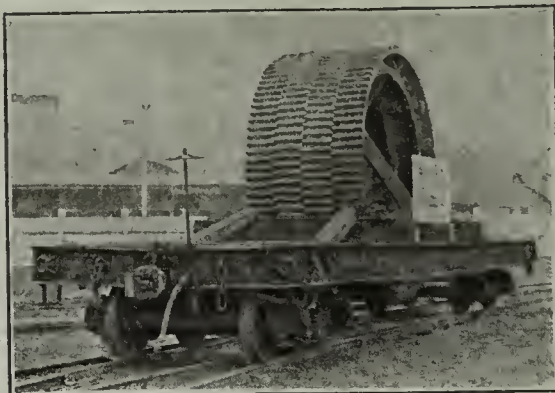
Morris Machine Works

Baldwinsville, N. Y.

NEW YORK OFFICE, 39 Cortlandt Street

HENION & HUBBELL, General Agts.
227 No. Jefferson St., Chicago

Stroh Process



First shipment of gears for Universal-Portland Cement Company's plant of Duluth which is being equipped with Stroh Process Gears and Pinions.

Pinions and Gears

Grinding Plates

Crushing Plates

Track Wheels

Sprockets

Sheaves

Liners

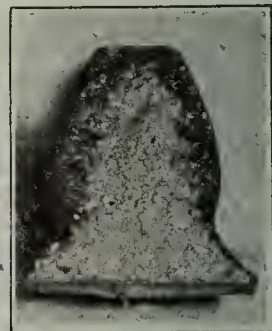
Mantles

Concaves



Trade Mark
Registered

WEAR-PROOF - LOW PRICED



Fracture of
Involute Tooth

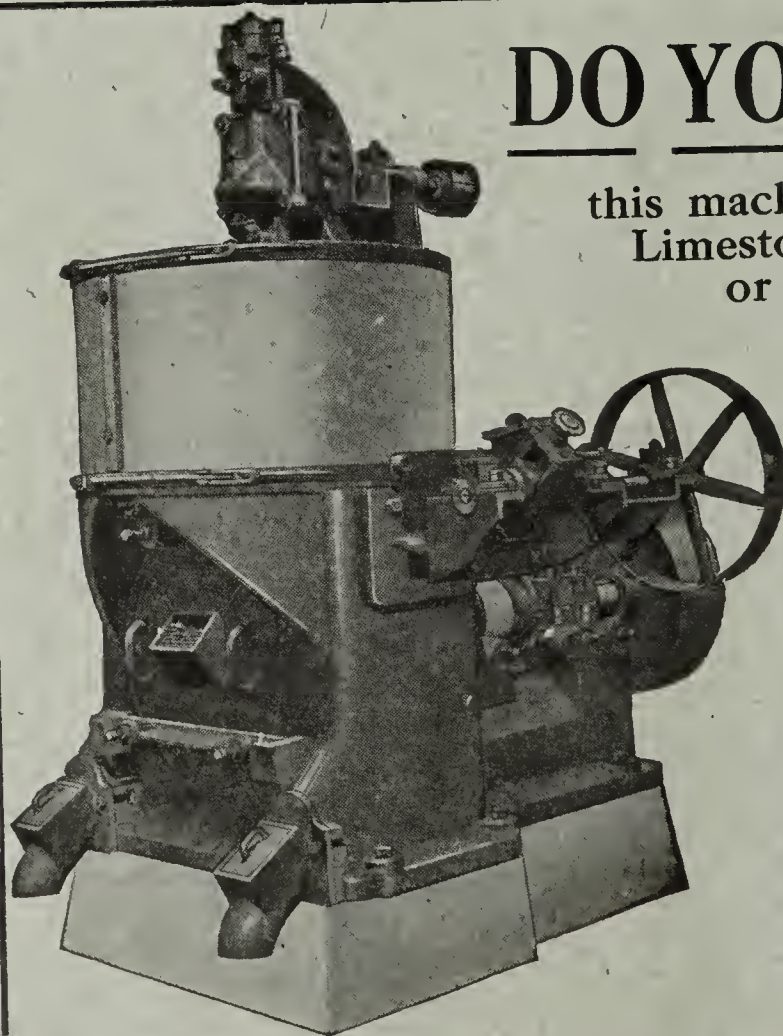
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Kennedy-Stroh Corp.

PITTSBURGH, PA.

DO YOU KNOW

this machine will grind
Limestone, Clinker
or Coal and



FINISH IT
AT ONE OPERATION?

6-8 Tons Limestone
12-15 Bbls. Cement
PER HOUR

**SIMPLIFIES
EQUIPMENT**

The BONNOT CO.
CANTON, OHIO

909 New York Life Bldg.
KANSAS CITY - - MO.

The Bradley Hercules Mill

Is rapidly showing the cement world that a successful preliminary pulverizer is obtainable. The Ball Mill and Kominuter have seen their day. The Hercules Mill has succeeded them in Five Large Cement Plants and many other companies will follow suit when conditions warrant.

WHY NOT PREPARE FOR BIG BUSINESS NOW?

You know it is on the way, and when it arrives you should have the largest and most economical grinding machinery possible. Large units mean economy. The Hercules is the largest pulverizer unit manufactured and has demonstrated its practicability to many large producers.

WRITE FOR DESCRIPTIVE LITERATURE

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MANUFACTURERS OF

THE GIANT GRIFFIN MILL—The Most Successful Single Stage Pulverizer



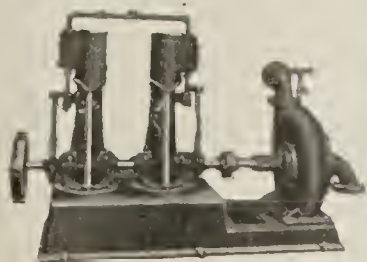
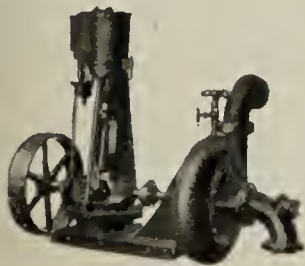
SAND-GRAVEL DREDGING PUMPS

are our specialty. We build a full line of Standard Pumps for the most common requirements as well as a complete line for High Heads, either Motor Driven or Engine Driven.

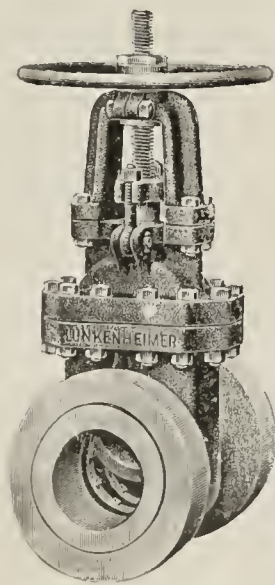
Ask for Bulletin C-30. It Tells You More About Them.

ERIE PUMP AND EQUIPMENT CO.

Successors to the Erie Pump and Engine Works
Erie, Pa.



LUNKENHEIMER "VICTOR" GATE VALVES



The most extensive line of Gate Valves made. From the great variety of designs, a type can be found to meet every purpose.

They have a single solid wedge disc with two seating faces. The seat rings are inserted in the body in exact alignment with the disc faces, permitting the renewal of these parts should they become worn.

The body is scientifically designed to withstand strains and prevent distortion. Passages are free and unobstructed.

Lunkenheim "Victor" Gate Valves are made of Bronze, Iron Body Bronze Mounted, "Puddled" Semi-steel and Cast Steel.

Specify them—Try them—you'll find them O. K.

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THE LUNKENHEIMER CO. —"QUALITY"—

Largest Manufacturers of High Grade Engineering Specialties in the World

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Power & Mining Machinery Co.

Kiln Supporting Frame

Our Standard Design

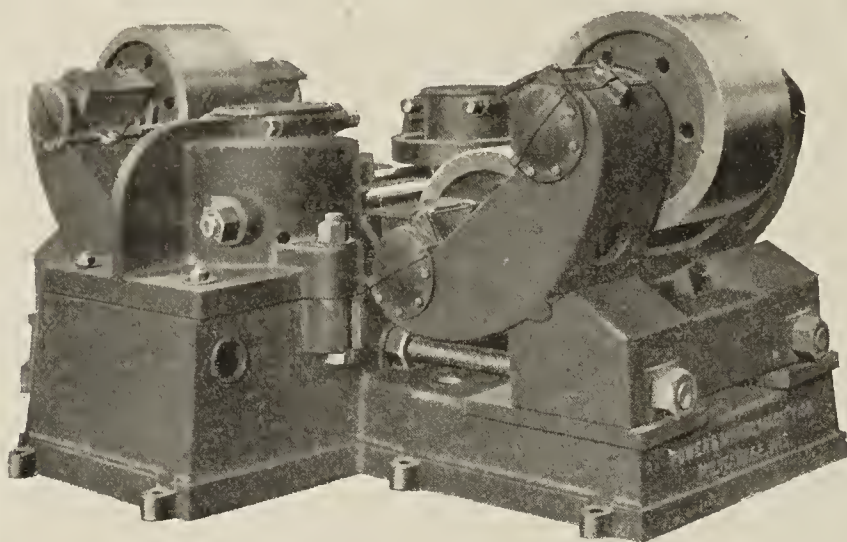
As built by us for the past eight years.

Twenty-five kilns ranging from 8' x 125' to 10' x 240' furnished to ONE CEMENT COMPANY, besides a large number of smaller installations.

This, as well as the universal approval of our design is proof THAT IT IS THE BEST.

We also build Dryers, Coolers, Gyratory and Jaw Crushers, Pan Conveyors, Screens, etc.

Send for Catalogue No. 7-108.



Power & Mining Machinery Co.

Works, Cudahy, Wis. New York Office, 115 Broadway
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M 311.2

Vulcan Kilns

VULCAN Kilns are conceived, designed, constructed, shipped and erected by kiln *experts*—men whose life work is *kiln-making*. They work hand in hand with the best engineers of the kiln users. Do you see, now, why sixty-five per cent of all kilns are VULCANS?

Vulcan Iron Works

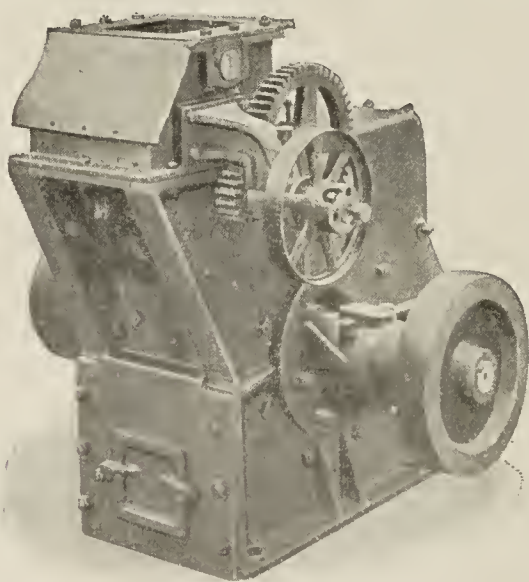
1745 Main Street WILKES-BARRE, PA.

New York Chicago



PULVERATORS

FOR PULVERIZING RAW MATERIALS



Any capacity, producing 50% to 65% of product through 200 Mesh Sieve, increasing tube mill output, fineness, and value of your product. Write for Bulletin No. 4028, describing Pulverators — pulverizing by a new principle.

Allis-Chalmers Manufacturing Company

MILWAUKEE, WISCONSIN

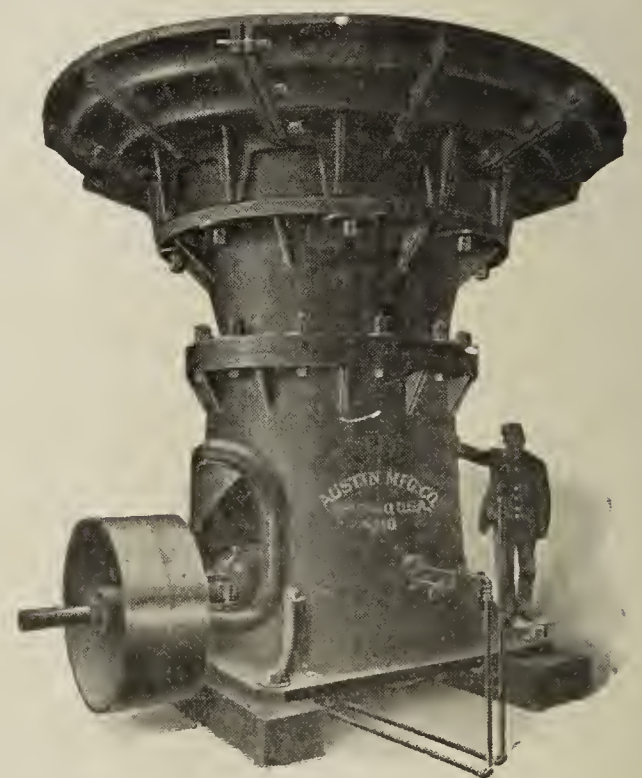
Offices in All Principal Cities

For Canadian Business refer to Canadian Allis-Chalmers, Limited, Toronto, Ontario, Canada

Foreign Representatives

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The World's leading Ore and Rock Crusher. Its many superior qualities and mechanical advantages have won the highest reputation amongst Mining Engineers and Quarrymen.

Made in NINE sizes with capacities from 50 to 5000 tons per day. Smaller sizes can be mounted as Portable Plants. Thousands in use. Plans and specifications furnished for any size of Plant.

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CHICAGO -:- NEW YORK

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Jones Superiority

Insure the successful operation of your plant
by installing

THE JONES

Line of Transmission Machinery

Is used by progressive manufacturers throughout the United States. We have our own foundry, machine shops, metal working department, pattern departments, etc., etc. We employ first-class help in all departments and use high-grade materials. When you are in need of anything in our line, try us. We manufacture a complete line of

POWER TRANSMITTING MACHINERY

Pulleys, Gears, Rope Sheaves, Friction Clutches, Belt Conveyors, Shafting, Conveyors, Sprocket Wheels, Gears, Hangers, Buckets.



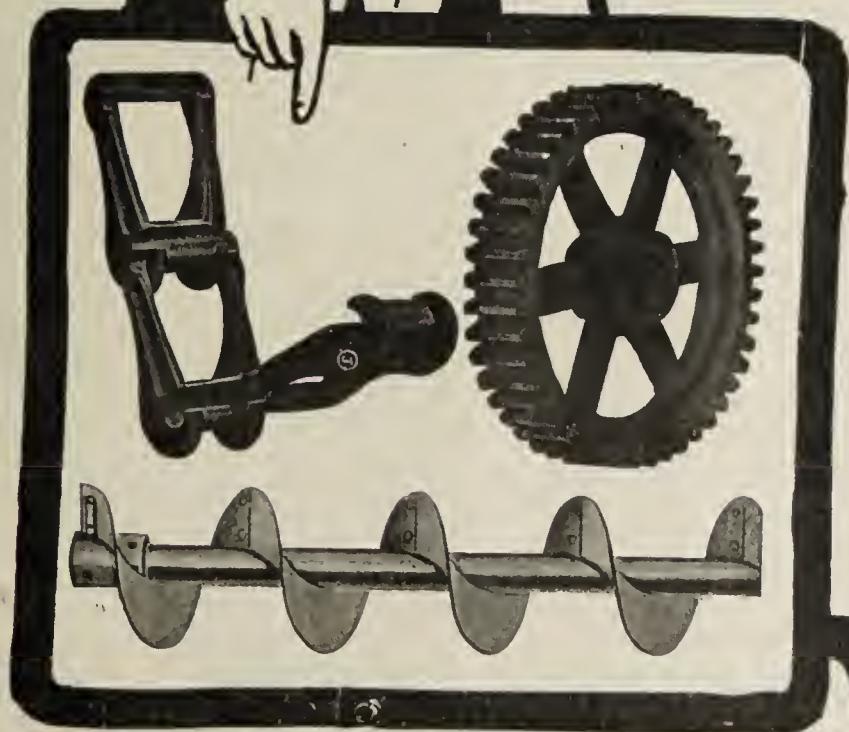
ALSO
ELEVATING
—
CONVEYING
MACHINERY

SERVICE

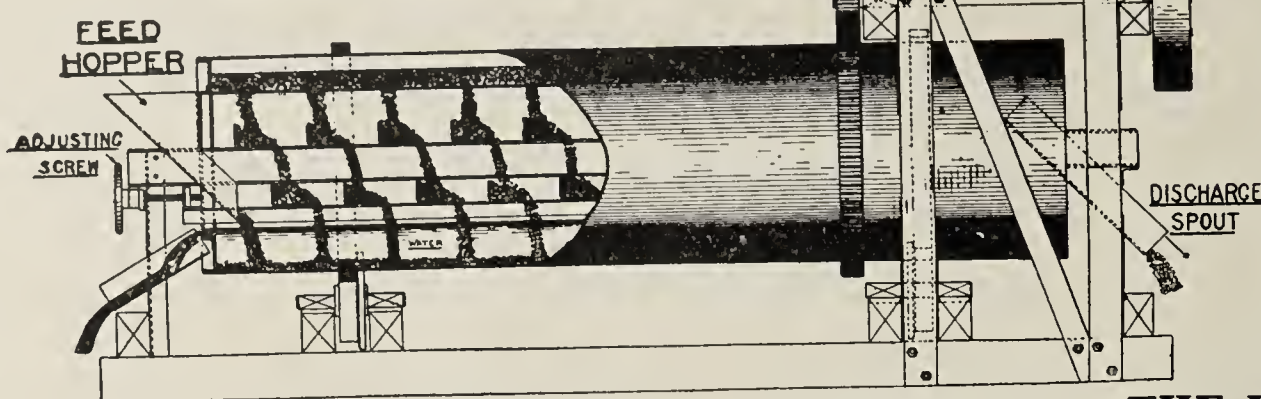
We have built up a reputation for quick shipments. Avail yourself of the JONES SERVICE. We can make shipments on some articles the day following receipt of order.

W. A. Jones Foundry & Mach. Co.

West North Avenue
CHICAGO



DULL IMPROVED TUBULAR GRAVEL WASHER



The drawing above gives a general idea of the design of the Dull Improved Tubular Washer. The operative principal is that of tumbling the material about in a bath of water as they progress through the length of the cylinder.

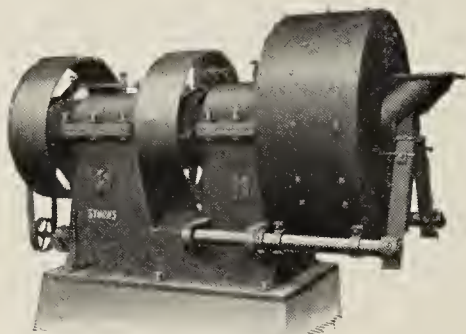
Convert Bank Sand and Gravel into A 1 Concrete Material by Washing It Yourself

A durable washer for contractors' use. Produce your own clean aggregates.

Dull Improved Tubular Washers are built regularly in diameters from 30 to 60 inches with lengths of 8 to 20 feet.

A Special Booklet Sent on Request

THE RAYMOND W. DULL CO.
1912-1914 Conway Bldg., CHICAGO



PATENTED

EVENTUALLY-SYMONS DISCS

EVENTUALLY Symons Disc Crushers

Will be installed in your plant

CAPACITIES—5 TO 120 TONS PER HOUR

Manufactured and Sold only by

CHALMERS & WILLIAMS
CHICAGO HEIGHTS, ILL.

"THE TWENTY-FIRST CENTURY BAG"

"VALVE BAGS"

THEY ARE THE BEST
FOR CEMENT, LIME,
PLASTER, ALCA,
GROUND STONE, ETC.

SAVE MONEY AND TIME BY USING THEM

They Are Easier to Handle and More Economical

The Strongest Paper Bag Made

BATES No. 1 ROPE VALVE BAG

(PATENTED)

Write us for Samples and Quotations



The Urschel-Bates Valve Bag Co.

TOLEDO, OHIO.

Manufacturers of
Open Mouth and Valve Bags

100
Years
Ahead of
All the Rest

*Heavy Sledge
Hammer Blows
or a Milled
File Make No
Impression on
"INFUSOED"
Steel Parts . .*



Some of the Things the "INFUSO" Process Does

Increases THREE TIMES the life of gears, pinions, couplings, spindles, shafts, forgings and heavy duty parts of all kinds.

"INFUSOED" ROLLING MILL GEARS GIVE MONTHS OF SERVICE WHERE ORDINARY GEARS LAST ONLY A FEW WEEKS.

Increases tensile strength by 50 to 100%.

Produces the strongest, toughest and most durable steel.

Eliminates all waste in material due to improper treatment.

The "INFUSO" Process Is Not Case Hardening

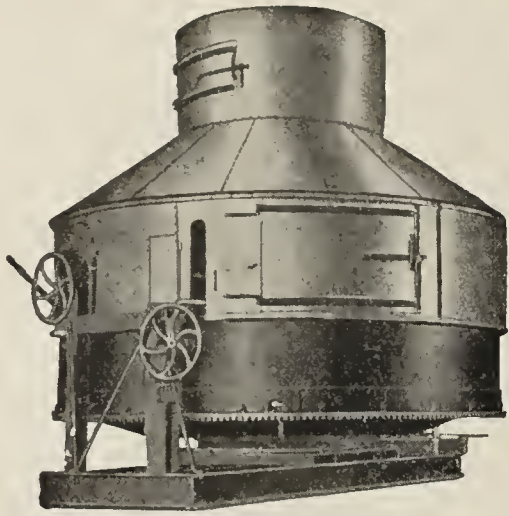
It is a scientific and practical method of heat treating which in every case renders any steel stronger, tougher and more wear-resisting. It builds up the core of the metal as well as the surface and makes a strong, tough core. It is the result of eight years' experimenting in laboratory and in actual practice.

Let Us Serve You as We Are Serving Many Others

Our corps of experts in the science of commercial heat treating are at your service. THE "INFUSO" PROCESS IS TOO IMPORTANT FOR YOU NOT TO INVESTIGATE FULLY.

THE STEEL IMPROVEMENT CO.

Cleveland



Clyde Hydrator with Hood
"The Common Sense Way"

SIMPLICITY IS THE KEYNOTE OF SUCCESS

IT does not take a "master mind" to install a CLYDE Hydrating plant, nor does it take a "high priced" engineer to run one. If **YOU**, Mr. Lime Manufacturer, realized how simple it is to obtain a PERFECT HYDRATE, with the CLYDE HYDRATOR you would place your order with us by FIRST MAIL. Write us today—NOW, and let us explain to you what CLYDE PROCESS hydrated lime is and how to obtain the best results, then

Use your own judgment—it's up to you

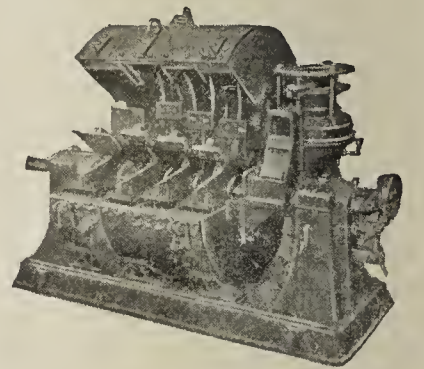
H. MISCAMPBELL - Duluth, Minn.

Patentee and Sole Manufacturer

BURN PULVERIZED COAL BY THE AERO SYSTEM

BECAUSE

1. It gets every available B. T. U. out of the coal.
2. Makes available slack coal and screenings at a fraction of the cost of mine run and lump coal and oil.
3. Eliminates the danger of fire or explosion from fuel in storage.
4. Both temperature and quality of flame accurately controllable at all times.
5. Construction prevents clogging by obstructions and guarantees continuous dependable action.
6. Perfect combustion is effected—No soot—no smoke, no free oxygen, no CO.



Shall We Send "Real Evidence"?

AERO PULVERIZER CO., 61 Broadway, NEW YORK

FOUND AT LAST "HERCULES" SOLID WELD STEAM SHOVEL CHAIN



The Chain that put the **SHOVE**
in Steam **SHOVELS**

MADE ONLY BY

THE COLUMBUS CHAIN CO.
LEBANON, PA. COLUMBUS, OHIO



Spur Gear Reductions made in any horse power and any reduction

Everything in Cut Gears

We have the largest plant in the West, equipped with the latest improved tools. Quick deliveries, low prices and first-class work our motto.

FOOTE BROS.

Gear & M. Co.
210 to 220 N. Carpenter St.
Chicago

Cut Bevel Gears

Twenty-foot cut bevels is our limit and we can make bevel gears from this down to the smallest.

Let us solve your

Bevel Gearing Problems

—no matter how simple or complicated.

Address Dept. C

Nuttall
Pittsburgh

Made in U. S. A.

If You Operate a Lime, Stone, Cement or Sand and Gravel Plant

It will pay you to send for our new General Catalog No. 56 and get full information on Chain Belt, Elevators, Conveyors, Elevator Buckets, Screens, etc.



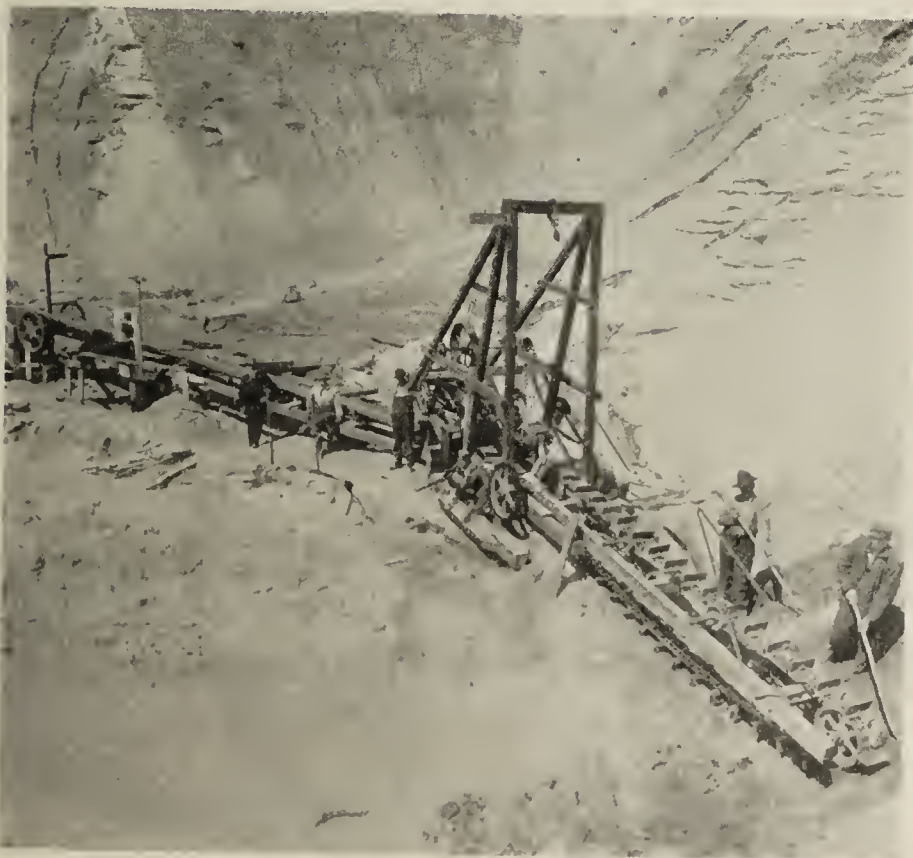
Chabelco Steel Chain Belt

CHABELCO STEEL CHAIN BELT

Practically no load is too heavy for this Chain Belt to withstand the strain and consistently handle at a minimum cost. If your work is heavy and ordinary Chain Belt is constantly breaking it will pay you to investigate CHABELCO. It has the right combination of hardness without brittleness, strength without softness. All pins and bushings are case-hardened and tested individually under the scleroscope for hardness.

Elevators—Conveyors

The Illustration shown is that of a Sand Digging Conveyor mounted on a boom which can be raised or lowered. This entire plant is operated by three men and has a capacity of 600 cubic yards or twenty cars per day. Under favorable conditions plant can be operated at a cost of as low as 5c per cubic yard including all labor, power and other operating expenses. This is only one of the many kinds of elevators and conveyors that we build.



Owned by Fisher Sand and Gravel Co., Janesville, Wis.

Chain Belt Co.

11th Avenue

Milwaukee
Wis.

Catalog
No. 56
yours for
the asking

Kindly send us your new Catalog No. 56.
Name
Address



"The Dust in Cement Works"



This Interesting Booklet Will Be
Sent Free Upon Request

Why It Should and How It Can Be
Removed and Collected

CONTENTS

Collecting of Dust from:

Raw Material Dryers

Coal Dryers

Rotary Kilns

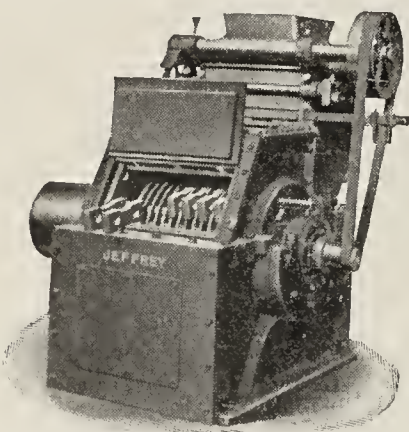
Without Heat-Utilization
With Heat-Utilization

Mills and Conveyors

Simon, Buhler & Baumann, Inc.

2 Rector Street, New York

The Leading Engineers and Manufacturers of Modern Dust-Collecting Machinery



**One
Operation—**

**Gives a
Fine Uniform
Product**

A test recently made
with a

Jeffrey Type D Swing Hammer Pulverizer

on Dry Limestone using $\frac{1}{4}$ inch screen
bars produced the following results:

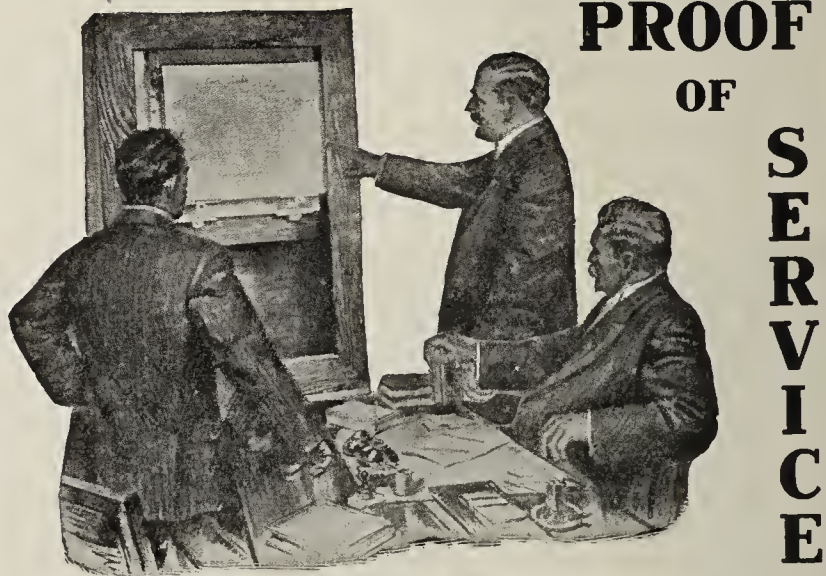
99½%	- - -	10 Mesh
85%	- - -	40 Mesh
62½%	- - -	100 Mesh

The above results are conclusive evidence
that the grinding is done in suspension
and not on the bars.

Send us a 50 lb. sample of your
product for test, also write for Bulletin
No. 132-14, giving full particulars.

Jeffrey Manufacturing Co.
914 North Fourth Street COLUMBUS, O.

2-1-15



This Superintendent and Chemist can show the
President just what conditions are in the plant
without leaving the office.

They use Recording TWINKO Pyrometers and
have an absolute check on the Kilns Night and
Day. What has helped them will help you.

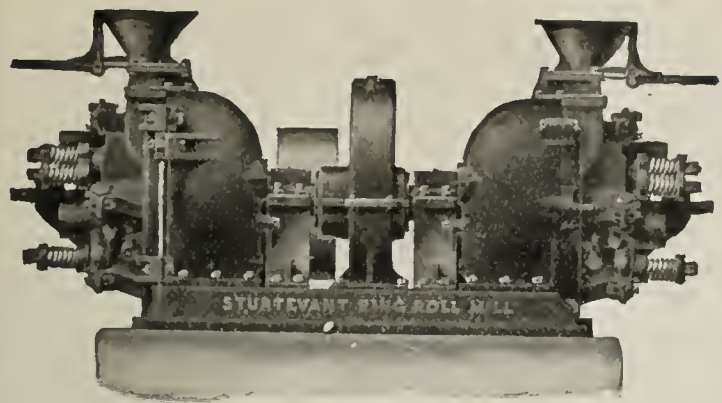
Explained in Bulletins Nos. 4 and 5

Thwing Instrument Company

451 N. Fifth Street

:

Philadelphia, Pa.



STURTEVANT RING-ROLL MILL

For CLINKER, LIMESTONE and COAL
THE LARGEST PRELIMINARY GRINDER BUILT

CAPACITY PER HOUR ON CLINKER
80 TO 120 BBLs. TO 20 MESH WITH 80-90 H. P.
50 " 80 " " 40 " " 80-90 H. P.
50 " 60 " " 80 " " 80-90 H. P.
UPKEEP APPROX. 1/10 C. PER BBL.

The Ring-Roll Tube Mill Unit can produce cheaper cement from every standpoint — upkeep capacity, low power and continuous operation than any other. Ask the users, they can prove it to you, and we can.

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NEW YORK

PITTSBURGH

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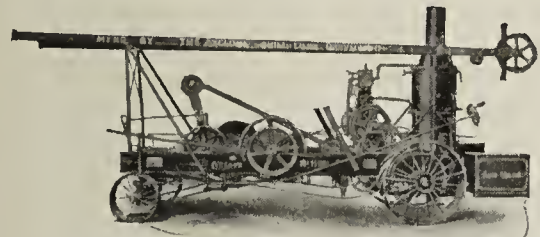
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LONDON, ENG

Not What We CLAIM, But What We DO!!!

ASK OUR COMPETITORS to place their machines in YOUR quarry in competition with a CYCLONE — and listen to their lame excuses

A DRILL and a GUARANTEE that CAN'T BE BEAT



We will place our machine in *your* quarry, under *your* supervision, in competition with any or all makes of machines of the well-driller type on the market. If the CYCLONE fails to drill MORE HOLE at LESS COST than any drill in the contest, you are under no obligation to us.

You are the judge as to whether or not CYCLONES will be most adaptable to *your* individual requirements.

Send for Catalog B-25

Which describes these Modern Cost-Cutters of the Quarry

Chicago Office:
418 Hartford Bldg.

THE CYCLONE DRILL CO., Orrville, Ohio

New York Office
50 Church St.



HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs — no lapped and riveted joints to come apart — flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our No. 38 Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

H. W. CALDWELL & SON CO.

17th Street and Western Ave., CHICAGO

NEW YORK, Fulton Bldg., Hudson Terminal, 50 Church St.

Henry Heil Chemical Company

210 to 214 South Fourth Street, ST. LOUIS, MO.

We make a specialty of
supplying cement works with

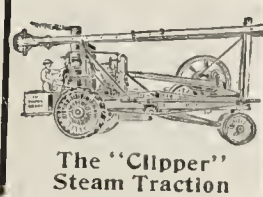
Chemical Apparatus, Chemicals and Reagents

Gilmore's Needles, Cement Moulds, Vicat Apparatus,
Schumann's, LeChatelier's and Jackson's
Specific Gravity Apparatus, Etc.

**Pyrometers, Calorimeters
High Grade Goods Only**

Write for our Large Illustrated Catalogue

"Clipper"



Blast Hole Drill

Known as "The Drill That Drills"

Driven by Steam, Compressed Air, Gasoline or Electric Power; is made in many sizes and types and is thoroughly up-to-date.

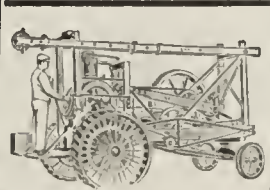
This simple, economical and long lasting machinery is used by the leading Cement Manufacturers, Stone Producers and Railroad Contractors of the present day.

The "CLIPPER" is a Blast Hole Drill!

It has always been a Blast Hole Drill!

It was never called a Blast Hole Drill for a few weeks and then changed in hopes it could be made a Blast Hole Drill!

It is a Blast Hole Drill for all conditions — soft rock and hard rock — shallow holes and deep holes; in fact, with a "CLIPPER" Machine you are safe!



The "Clipper"
Gasoline Traction

There is not a cog wheel in the drilling part of the "CLIPPER" MACHINE.

The Loomis Machine Co.

TIFFIN, OHIO

THE BISHOP PATENT DERRICK EXCAVATOR

FOR HANDLING SAND, DIRT, GRAVEL, CRUSHED STONE, ETC.

There are only two machines that will dig material that is met with, and they are the steam shovel and the dipper dredge. By using the Bishop Patent Excavator, any derrick having a rectangular or a square boom can be converted into a steam shovel or a dipper dredge made out of a derrick boat.

This apparatus can dig anything a steam shovel will dig, and

its range is from the base of the derrick to the end of the boom and below the base of the derrick the length of the dipper arm.



WHY KEEP AN EXPENSIVE

steam shovel at work at the pit excavating sand and gravel when lower-cost equipment will do the same work? With your regular derrick you can dig material from the bank, you can excavate earth, you can handle loose materials on the construction job.

The Bishop Patent Derrick Excavator is an attachment that is readily adjusted on your derrick. It consists of a carriage traveling on the boom, a dipper and a dipper arm. A square or rectangular derrick boom, a double-drum engine and swinging gear are required. One man operates the equipment.

UNION IRON WORKS

HOBOKEN, ERIE SIDING, NEW JERSEY

The Great Cost Reducer in Stripping Over-burden

from Stone Quarries, Phosphate Rock, Coal, or similar other material, and performs the entire work at a single operation without rehandling. These are the important advantages of

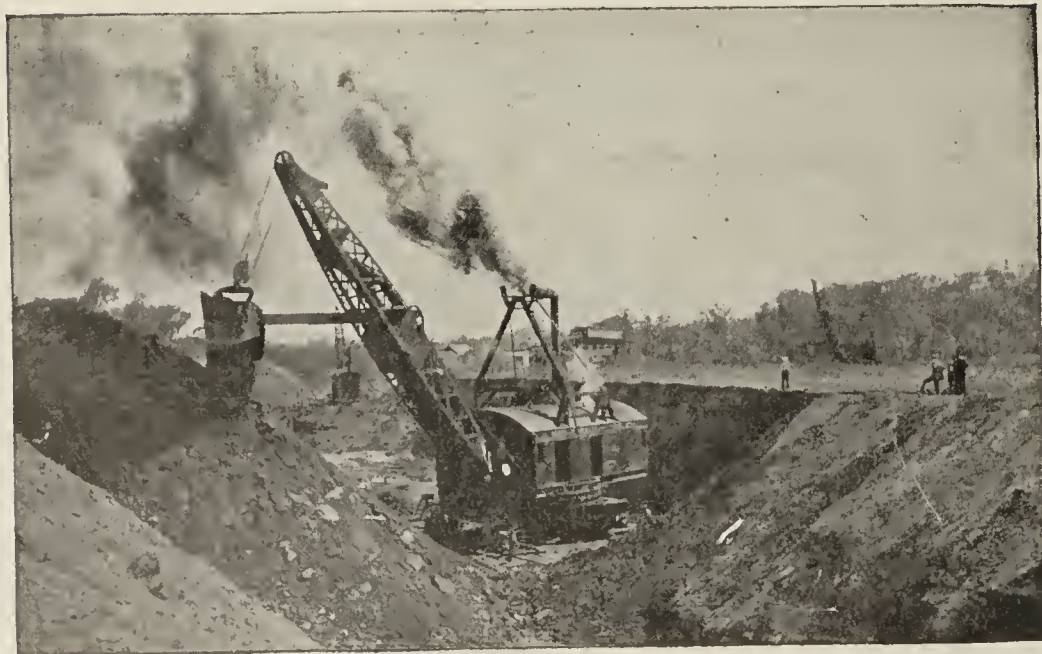
THE MARION MODEL 250 REVOLVING SHOVEL

This machine is provided with an extra long boom for making wide cuts and dumping the excavated material far enough to one side so that the rock or stone thus uncovered may be taken out without being partly under the spoil bank. This eliminates the handling of the over-burden in cars and reduces the labor required to the shovel crew.

The uncovered material is mined immediately following the shovel, so that when it completes one cut it can return on another, this time despositing the over-burden in the open pit where the coal, for instance, has been taken out.

The Model 250 will handle over-burden of far greater depth and width of face than the ordinary excavator.

Proof of this economy can be shown where shovels of this type are now in actual operation.



Write for Circular 250, giving more complete information.

The Marion Steam Shovel Co.
Dept. V, MARION, OHIO

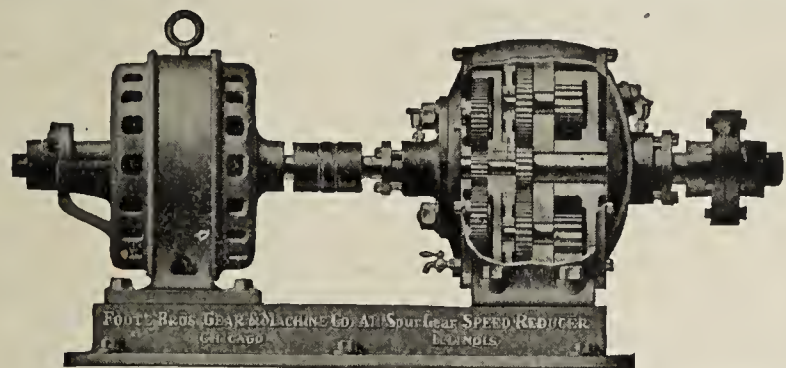
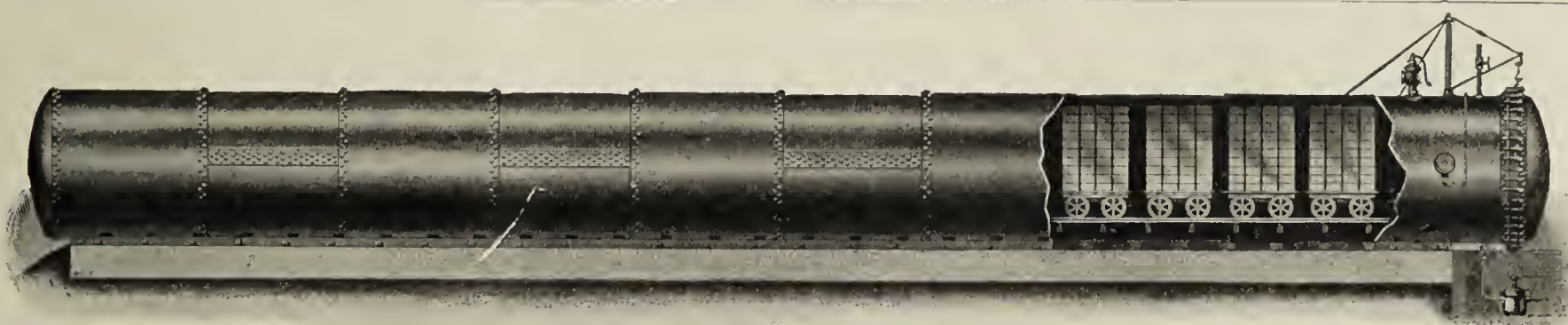
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Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

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DRAG LINE EXCAVATORS

built in various sizes and to meet any requirement.
Sturdy in construction. Regular in operation.

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Heavy Equipment for Heavy Service

Cement Mills must run twenty-four hours every day in the dustiest, dirtiest, hardest conditions in which machinery can be operated.

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**Elevating, Conveying and Power
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202

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We make a complete line of specialties in connection with our engineering work, and our foundries and shops are especially fitted for furnishing high grade equipment of this character.

Original Ewart Detachable Link-Belt

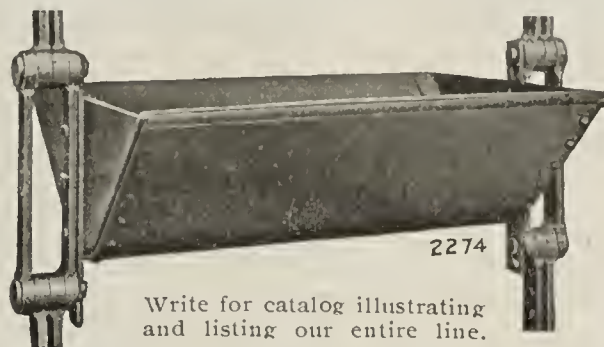


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Malleable Iron and Steel Buckets



Style "A."
A popular Link-Belt Bucket.



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Ground to fit all chains of standard pitch.

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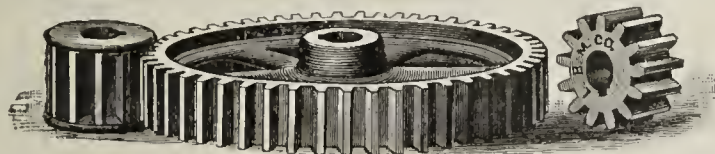
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Our catalog No. 79 shows our accomplishment in this line.

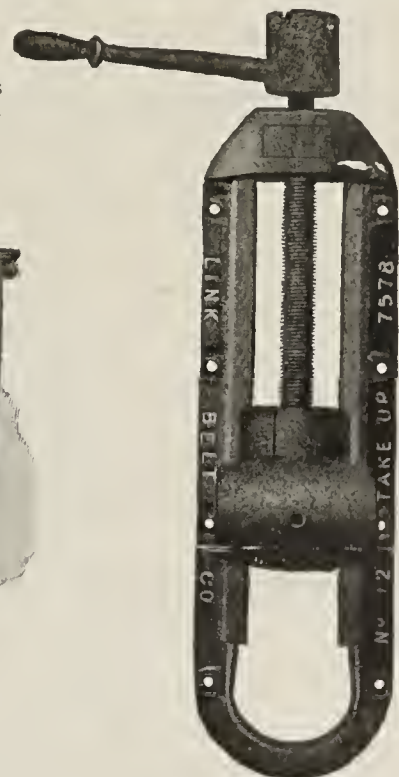
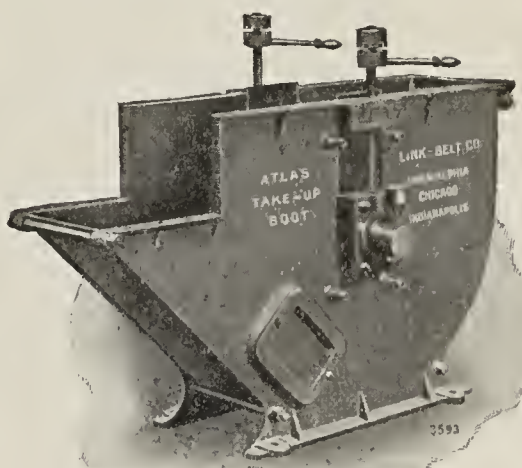
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4691

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are a specialty with us—standard Boots can be shipped from stock. We make different styles to suit conditions.



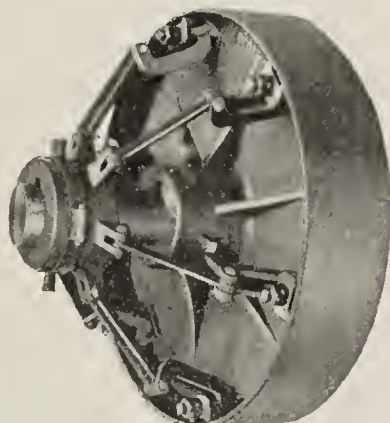
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The Link-Belt line is complete in power house specialties—our undercut gates, chutes, elevator castings, etc., are built to the high standard of Link-Belt products.

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The Link-Belt Disk Friction Clutch has proved its worth by years of service in our engineering work, and we highly recommend it. Write for Booklet.

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A Distinctive American Product

DUXBAK Leather Belting has won an immense trade in all countries of the world because it gives the maximum return for its cost. Compared with ordinary leather belting or with canvas or rubber beltings it is far more economical and gives much more efficient service.

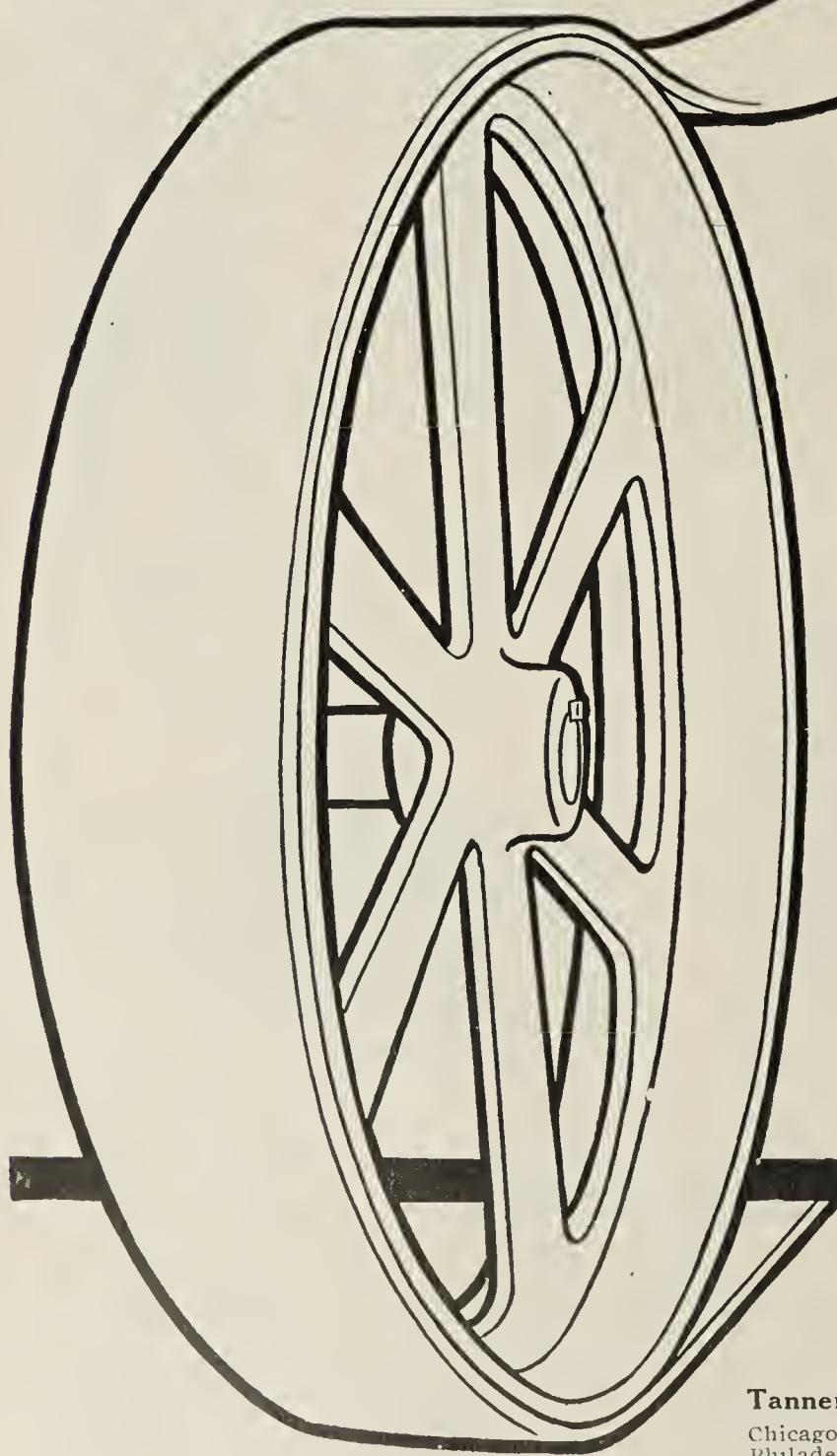
DUXBAK was designed primarily for use in damp climates, or where water, steam, oil or acid fumes destroyed ordinary belting. But the waterproofing treatment, through which DUXBAK leather is put, so increased its flexibility and pulley gripping qualities that we soon found power users applying it to all their drives.

This double quality makes DUXBAK the best belting for the dealer to sell as it supplies, in itself, every belting requirement of any belt user, whatever his industry may be.

We have many interesting features to tell you about the sale and uses of DUXBAK Belting. Write us for full particulars, sample and prices on any size and any quantity you require.



Prompt deliveries made from our various depots in the world's principal trade centers.



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ESTABLISHED 1868

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Supremo Conveyor Belt



Adapted for all general requirements such as conveying gravel, cement, clinkers, crushed stone, grain, clay, woodpulp, salt, tailings, etc. It is far above the so-called standard belt, and one that has given general satisfaction under more than ordinary conditions.

There is a diversified list of uses for Conveyor Belting. We have carefully studied the different conditions and materials and stand ready to construct a belt for the duty to be imposed, which is often of an abusive character. Conveyors for hot cement, hot coke or slag, crushed stone, silica sand, etc., represent a few of the extreme cases.

Manufactured by

REVERE RUBBER COMPANY
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F. W. Freeborn **ENGINEERING** **C O M P A N Y**

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Fuller Face Hardened Sprocket and Traction Wheels

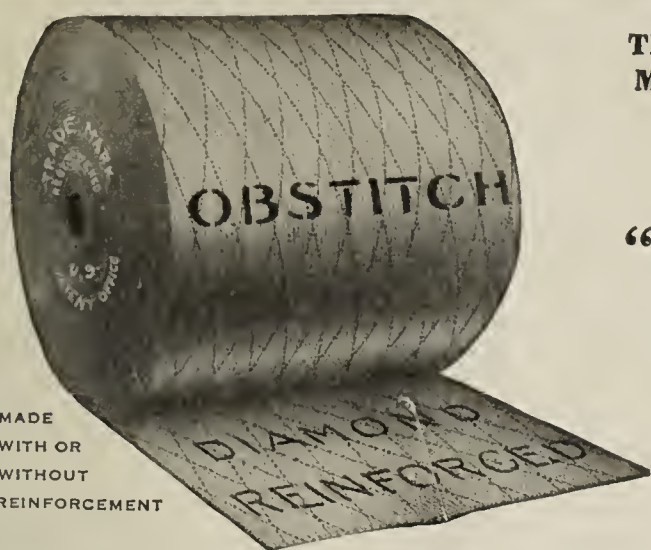
Unequaled for severe duty. Proven by test. Their use prolongs the life of chain.

RESULTS:—Increased Efficiency—Saving in Operating Cost.

We manufacture all kinds of wearing parts subjected to abrasion.

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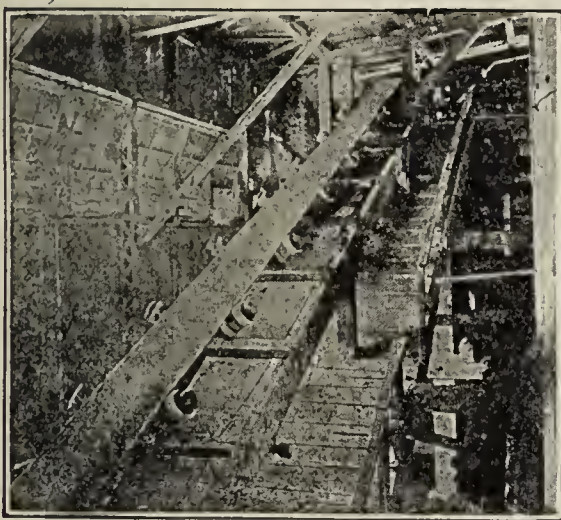
Lehigh Car, Wheel & Axle Works, :: Catasauqua, Penn.

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MARK**- OBSTITCH -**Reg. U. S.
Pat. OfficeWith Patented Diamond
REINFORCEMENT**"THE BEST TEXTILE BELT IN THE WORLD"**For Cement Mills, Stone Crushers, Pulverizers,
Brick, Gypsum, Fertilizer Plants, and
General Transmission**MOUNT VERNON BELTING COMPANY**

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A 20" Wet Clay Conveyor

"WOOSTER BELTING"*Is a Solid-woven Fabric Impregnated with Asphaltum*

THE CONVEYING OF WET, HOT OR ABRASIVE MATERIAL, at slow speeds, offers a combination of destructive elements, with adverse conditions and high working tensions, which quickly exhaust inferior belting.

"WOOSTER" BELTING has proven its high efficiency and economy in service on hot clinker conveyors and other refractory materials in Mine, Mill and Power Plants. It has also demonstrated its superiority in conveying wet clay, and under moist conditions generally.

SCIENTIFIC CONSTRUCTION combined with a CHEMICALLY NEUTRAL ASPHALT TREATMENT is the SECRET OF ITS SUCCESS.

WRITE FOR SAMPLE AND QUOTATION

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"Veelos" Balata Belting is the strongest belt known to engineers, having a tensile strength of more than 9000 pounds to the square inch.

This belt is especially made for the hardest kind of service, such as cement mills, stone crushers, gravel plants, etc.

It is waterproof, you can run it in water or in the rain, without doing the least injury to the belt.

It does not stretch or shrink, you need not lose time and money in shortening this belt.

Every foot guaranteed, money refunded if not satisfactory.

*Write for samples and prices.***Manheim Manufacturing & Belting Co.**
Manheim, Lancaster Co., Pa.**TROJAN POWDER**

Is a high explosive perfected after years of actual use in every kind of blasting in quarry, mine and field, and in every climate. It is the cumulative result of research and experiment along practical lines after exhaustive tests under every known condition.

It is not only its disruptive force that makes Trojan superior to nitro-glycerin dynamite. Trojan has no liquid base to seep from the cartridges in warm weather to become a menace to life and property. It is fumeless and non-volatile. It eliminates entirely "powder headache" and nausea. It will do your blasting better and more economically than any other high explosive.

*Write for Booklet***Pennsylvania Trojan Powder Company**

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Hunsicker Bldg., Allentown, Pa.

National Life Bldg., Chicago

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Railway Exchange Building, Portland, Oregon

WARNING

To All Makers and Users of Waterproofing Compounds for Concrete

The patent of S. B. Newberry, Assignor to Medusa Concrete Waterproofing Co., has now been fully sustained by the United States District Court and U. S. Court of Appeals, and the McCormick Waterproof Cement Co. declared an infringer of said patent.

Suits against other leading manufacturers of waterproofing materials are being vigorously prosecuted.

Makers and Users

of Concrete Waterproofing Materials are cautioned that the sale or use of waterproofing material, unless bearing the Medusa trademark or the words, "Licensed under the Newberry Patent No. 851247" may render them liable to

Suit for Infringement

SANDUSKY PORTLAND CEMENT CO.
Sandusky, Ohio

Build Culverts Like This

New York State has the best Culverts in the U. S. A. Every worth while thing in the world is built upon a universal plan.

THE ORIGINAL COMPLETE COLLAPSIBLE CULVERT FORM, BUILT OF SPECIAL ROLLED CARBON STEEL PLATE THOROUGHLY GALVANIZED

One complete Form is all any Township needs. This is why they cost less than any Form ever built. Culverts from 12 to 60 inches over the one Form. All parts interchangeable. We are the largest exclusive manufacturers of Complete Collapsible Steel Culvert Forms in the world.

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80 per cent. of the Concrete Culverts built by the Town Superintendents of New York State in the past two years, prove this. One Form guaranteed to do the work of six ordinary sheet-iron Culvert Forms.

WE HAVE NO COMPETITORS—We guarantee our Forms to do exactly what we claim or we don't want your money. Write for large catalog. Good live salesmen wanted in the Central and Western States to learn our selling-plan.

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CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

WILLIAM SEAFERT, Editor and Publisher

OFFICE—1117 Schiller Building

Telephone, Randolph 934

Cable Address, "Seaferts" Chicago

Entered at the Post Office at Chicago, as second-class matter, July 21, 1896
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When your subscription expires, renew at once, using the blank which will be sent you. If it expires with this issue, your renewal must reach us before the 5th of the next month, to avoid missing the next number.

Advertising copy or changes in ads. must be in this office by the 25th of each month, as hereafter our magazine will appear on the 5th of the following month.

Advertising Rates Sent on Application

JOHN F. WALDRON

Advertising Manager

CHICAGO, FEBRUARY, 1915

OUR SUBSCRIBERS

During the past eighteen years, in which this magazine has been published, the aim of the editor and the circle of subscribers have undergone manifold changes.

When Cement and Engineering News started its career as the first American magazine exclusively devoted to "Cement," the manufacture of cement in the United States was in its infancy and the number of people interested in the publication was naturally limited.

At that time and for a considerable period afterwards the paramount questions were: What is cement? How is it manufactured and How is it used?

The manufacturer and the chemist, therefore, were our earliest subscribers. They were eager to receive the monthly publication on time and searched it carefully for all information, we were able to offer from manufacturing plants, or from scientific papers dealing with the composition of cement. Much of the information came from abroad, from countries that had manufactured cement for fifty years prior to the time when America started to produce cement on a large scale, and from experts who had made a life study of cement before anyone in this country began to look into the rudiments of cement chemistry.

The use of cement was limited in those early days of American cement manufacture; it was mainly confined to massive construction, harbor work, foundations and walls, bridge work and similar bulky work in which it was used by large contractors who were accustomed to the use of imported cement for similar purposes a long time before America produced its own cement.

Only since the development of the rotary kiln process of manufacturing cement, could cement be made cheap enough to admit it also to other fields of application. Sidewalk construction and reinforced concrete construction of simple design were taken up next.

This period created a new line of professionals in the art and enlarged the circle of subscribers. Their aim was to study the physical properties of concrete and to learn under which conditions success or failure resulted.

After this period had been successfully overcome and concrete construction was established as a safe and economical process of building, artistic uses could be thought of. This added the architect and constructor of ornamental designs to the number of our subscribers. All

decorative work, exterior or interior, belonged to this new field of usefulness of cement.

Thus grew the application of cement step by step. Each year doubled the number of people engaged in the business and added new methods to the former branches of the industry.

New chapters of discussion had to be added to our magazine when cement began to be used extensively in road construction, and again the subject of conversation was widened and the number of subscribers increased when small towns and the farming population began to take a keen interest in the manifold uses of concrete.

Our magazine, therefore, has grown with the uses of cement and our subscribers, who in the beginning were limited to a select class of cement manufacturers or contractors, now belong to all walks of life. Wherever cement is needed, this Journal is in its place. No engineer, no architect, no builder, can afford to be without it. Every home builder, every farmer, every one interested in public work, will find in it useful information and will be rewarded a hundredfold for the time spent in perusing its columns.

OUR FOREIGN TRADE

By James J. Hill*

"In our foreign trade which, though secondary, is of much importance to the country, the general public still mostly overlooks or undervalues what has risen to be a prime factor. We exult in the fact that in the value of domestic products exported we are now almost neck and neck with Great Britain. We exult in the showing of a balance of trade exceeding \$650,000,000. But we do not analyze. Our eyes look eastward or southward, and we are eager for new ventures in those directions. We squabble and higggle and refuse to understand the trade advantages already ours and those that we might now enjoy if we had looked toward the north instead during the last ten or fifteen years.

The rise of our trade with Canada to a commanding place is a striking phenomenon. The total of that trade for the last fiscal year was nearly \$536,000,000. In 1903 it was a little over \$178,000,000. In the ten years the increase was over 200 per cent. For the single year 1913, as compared with 1912, it increased 22.3 per cent. Our total exports to Canada last year, amounting to \$415,250,000, were \$83,000,000 more than those to Germany, and three times those to France. They were \$67,000,000 greater than our exports to all the other countries of the Western Hemisphere combined. They came within \$131,000,000 of equalling those of England. At this rate it is a question of only a few years when Canada will become our best customer. We have but one better today.

Distribute the balance of trade for 1913 in which we so rejoice. It amounts, for the whole world, to \$653,000,000. Of that total Canada contributed \$284,688,000, or 45 per cent. Almost one-half of the net receipts of the United States from its commerce with other nations comes from this one country. We spare no trouble or expense to drum up trade with the countries to the south of us. We have spent a great many millions of dollars on the Panama Canal. The main argument in its favor was the increased facilities that it would furnish for trade with the west coast of South America. San Francisco is preparing an international exposition to celebrate the opening of this great waterway between the oceans. The mother

* Extract from speech before the convention of the American Bankers' Association.

country of Canada declines to participate; and, under her courteous explanation, few doubt that the deciding reason was what many good lawyers, as well as common sense, declare to be a violation of treaty by remitting canal tolls on our own shipping and so discriminating especially against the shipping trade of Canada. The keynote of the approaching opening of the canal is the importance of our trade with the countries of the south to which it offers us a shorter and quicker route. Well, see what that amounts to. Our balance of trade last year with all North and South America, including Cuba and the West Indies, with this hemisphere from Greenland to Cape Horn put together, was \$183,869,000. If we leave Canada out, our trade with all the remainder shows a balance against us of \$110,000,000, mainly to pay for coffee. It is not difficult to decide what is the most valuable trade to us in the Western World. It is not difficult to discover who, if we consider only the amount and rapidity of growth in commercial relations, is our most desirable customer today.

To maintain that trade, to free it from every unnecessary burden, to cultivate the most cordial relations with the people who furnish it, these things are a proper care for all business men. Between the bankers of the United States and those of Canada there now exists an understanding fostered by the conduct of a business whose principals are universal, and whose practise crosses political lines without having to produce a passport or pay a duty. I am sure that you need no urging to do whatever may be within your power to unite more closely the business interests of these countries which nature herself presents as to the two great factors, co-operating, each in its own way and its own independent sphere, for the development of this continent and the progress of the world."

Immediately on the commencement of the present European trouble, first week in August of last year, Canadian industries began to feel the circumstances. Thousands of men were thrown out of employment in localities from one end of the country to the other. There was no panic. The situation was resolved into these phases:—feeding the unemployed and attempting to make all surplus labor productive, doing our share to balance the unproductive energy being expended in the war. Prior to hostilities in Europe the Canada Pebble Company, Limited, were producing a normal sized stock. Subsequent to the enforced idleness of labor, this Company took a chance on marketing a large excess stock in order to give employment to extra men and brought the total of pebble pickers up to three times the usual number.

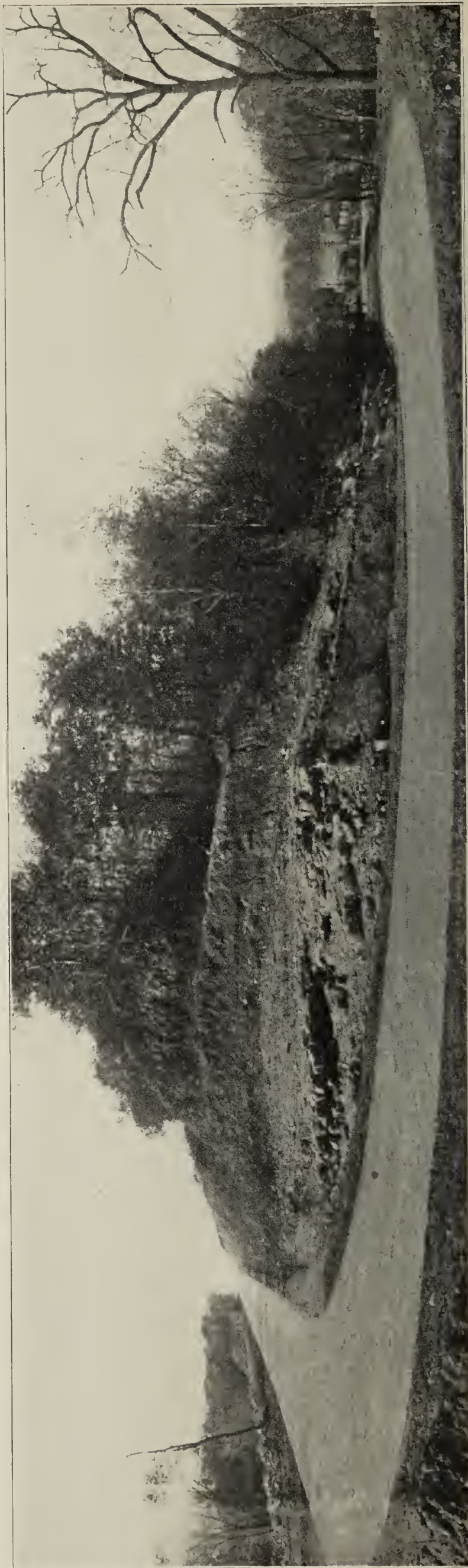
Some of this extra stock is still on hand. We look for a market. Who is Canada's greatest international commercial friend? It is the United States. For 1913 the balance of our trade with that country was in favor of the United States to the amount of \$294,688,000.

We do not pretend to be able to sell pebbles at "exact cost." You will find our prices reasonable, however. They are based to cover hazards contingent on the industry.

If the reader is in the market for pebbles, writes the Canada Pebble Co. Ltd., Port Arthur, Ontario, we ask him to communicate with us at once.

CONCRETE CULVERT PIPE

Reinforced concrete culvert pipe have been tested with 200-ton hydraulic jacks at Iowa State College. In one instance a 36-inch tile withstood a pressure of 106,000 pounds, or 53 tons.



Sharp Turn on Marquette Hill Road, La Salle County, Illinois.

"MARQUETTE HILL"—LA SALLE, ILL.

The sentiment in favor of good roads, strong throughout the country in general, has found very definite expression in La Salle Township. Through aid from private citizens, corporations, the State and the Town, a great deal has been accomplished, and much is in contemplation.

During 1913 the La Salle-Oglesby Concrete Highway was constructed. A beautiful concrete and steel bridge now replaces the former wooden structure over the Vermillion River.

The highway between the above mentioned points, which is more than a mile long, is now being concreted. The work is well under way and will be completed in June, 1915.

"MARQUETTE HILL," the scene pictured, is the latest road improvement to be completed.

Mr. T. G. Dickinson, on behalf of the Marquette Cement Manufacturing Company, tendered an offer to the Board of Highway Commissioners to improve the hill free of all cost to the Township. The generous offer was accepted and the work placed under the direction of the Illinois Highway Commission. Today MARQUETTE HILL is a model of its kind.

The grade was reduced, the road widened, and a concrete roadbed eighteen feet wide was laid. It is a wonderful improvement over the narrow, steep and dangerous Shippingsport Hill, which it replaces.

spect the marble ornaments of the old gardens abroad.

Nearest to the house is the Garden of Meditation, a rectangular piece of lawn, formed by high evergreen hedges. Its only decorations are ten flower pots, about three feet in diameter, which are ranged at each side of the lawn, and in the season filled with red geraniums. The green of the lawn and the old marble color of the flower pots make a pleasing contrast. At the end of this garden is a statue of Eve Repentant, a piece of marble sculpture of the highest artistic merit, and the combination of same with cast stone shows the great possibilities of decoration in the use of well executed concrete products.

The upper garden is divided from the main lawn by a pergola of massive cast stone columns. At right angles to this pergola is a rose trellis, the concrete work in this feature being of particularly rich design and resembling verd antique bronze, which color effect is produced by immersing the concrete castings when two weeks old into a solution of sulphate of copper. This immersion completely fills the pores of the concrete and forms an incrustation of the copper salts, similar to the oxidation of copper and bronze. A large lily pond and summer house of Gothic design complete the principal decorations of this garden.

The lower or water garden is bordered at its highest level by a balustrade of unique design in keeping with the Gothic buttresses and wall effects. These are built of field stone and the balustrade is made of concrete



Concrete Garden Ornaments.

GARDEN ORNAMENTS OF CONCRETE

All work shown herewith are views of various parts of the Castana estate, very appropriately named on account of the magnificent chestnut trees which predominate. This estate is located at Rosemont, Pa., near Philadelphia, and is the home of Alba B. Johnson, president of the Baldwin Locomotive Works.

The concrete work was wet cast, the particular aggregates being a mixture of graded silica sand and white marble, with Medusa white Portland cement. The plain work was cast in plaster molds and the ornamental or under-cut work in gelatine molds. After casting, at the age of ten days, the pieces were immersed in large tanks of acid solution, until the outer cement coating was removed. This treatment left a fine grain texture, similar to rubbed stone, and shows the aggregates to best advantage. The general color tone is warm gray and ivory, resembling in every re-

with a rather rough texture to harmonize with the stone piers. At the foot of this balustrade is a swimming pool, extending the full width of the garden, and flanked by sets of steps which are embellished with some especially well designed urns and vases. The water for this pool is supplied at each end by grotesque spouts of water life, modeled in concrete direct on the stone walls so as to produce the most natural effect—the heads apparently crawling out of the wall.

The central feature is a circular waterpool, about 18 feet in diameter, and designed to overflow, forming a sheet of water around its entire top edge, this being caught in the gutter at the base of the coping and from there draining under ground and supplying the well and moat at the lower end of the garden. At the axis of this pool to the left is placed an exedra seat, 20 feet in diameter, flanked by specially well modeled griffins, and the bench itself is enriched with a frieze of plant design interwoven with the names of the archi-

tects, a token of the owner's appreciation of their work. In the rear of this seat, at a higher level, is the Pergola of Seasons,—Spring, Summer, Autumn and Winter, emblematically represented by the maiden, wife,

block, by cutting off the surplus until only the final shape was left. In this case layer after layer of concrete was built up into a thoroughly welded mass, until the perfect column was created, true in line and



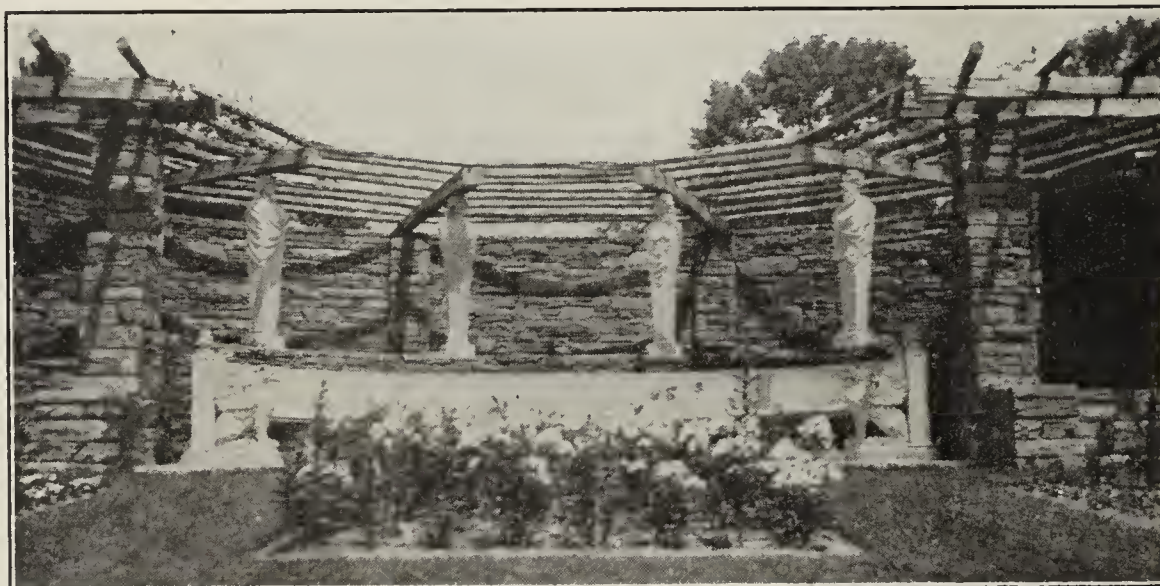
Concrete Garden Ornaments.

mother and age. The outlookers and rafters of this pergola are cedar logs and rest directly on the statues. Surrounding the center pool are four circular benches supported by crouching water fauns.

At the extreme end of the cultivated grounds has

texture and without a seam or casting mark.

Another interesting feature is the construction of the dome. After the parapet above the cornice was placed, the top ring or crown of the dome was set at its proper place, then eight ribs were fitted into grooves



been placed a Temple of Love, and with the beautiful woodland as a background it forms a splendid terminal of the formal gardens. It is of Doric order in design,



and the well finished details show an excellent example of the best in stoncrete craft. The columns were molded or turned upon a skeleton of expanded metal, as a stone column would be turned out of a rough

at the top of parapet and resting their upper end against the lower edge of the cross-piece. This formed a frame for the eight panels which closed the spaces between the ribs, the entire dome being formed of 17 pieces, no centering being used. The joints were then grouted and the outside of the dome received a coating of Medusa Waterproofed concrete, finished to match the balance of the work, so that the inside of the temple shows a paneled ceiling, and the dome seems to be cast in one piece. The inside frieze is embellished by a border of dancing and singing youths, after Donatello. The floor of the temple is made of concrete stone flagging in a geometric pattern.

The concrete stone work was executed and furnished under the direction of Adolf Schilling, Haddon Heights, N. J., (now manager of the Pompeian Stone Co.), after designs by Alexander Mackie Adams, architect, and the landscape designing is by John S. Cope, both of Philadelphia, Pa. Their co-operation in this work has produced one of the finest examples of formal gardens in this country.

CONCRETE SIDEWALK CONSTRUCTION

Proper mixing is frequently neglected in sidewalk work and it must be carefully watched. An excess of water must be avoided. It is not practicable to use as wet concrete in sidewalk construction as in some other classes of work. The top coating should have much more water than the lower layer and be of such a consistency as to work well under a trowel, write Spencer Bros., Kokomo, Ind.

One of the common mistakes made by inexperienced workers is to mix too large a batch at one time; and then when the mortar has begun to set before it could be placed, to attempt to remix or retemper same. Under no circumstances should this be done, as once concrete or mortar has taken its initial set, or begun the hardening or drying out process, the addition of water or mixing will not delay this process. Any remixing of concrete after hardening has begun will generally weaken it to such an extent as to make it unsatisfactory. The saving which may result from the use of a portion of a batch of concrete which is retempered will not justify the introduction of uncertainties into the work. Retempered concrete should not be used. Any concrete left over at quitting time should be wasted.

In transporting concrete, care must be taken to prevent loss of material in any way. Wheelbarrows must not be overloaded. Loss of any surplus water in the mixture may rob it of a portion of the cement carried in suspension.

The concrete should be deposited within the forms on a subbase previously wet and tamped into final position as soon as possible. The surface of the concrete should be brought to a plane parallel to the proposed finished surface of the walk, and at a distance below it equal to the thickness of the wearing surface. To insure this the concrete should be struck with a straight edge long enough to span the walk, and notched out at the ends so that when placed on the side forms the straight edge will define the correct grade of the base.

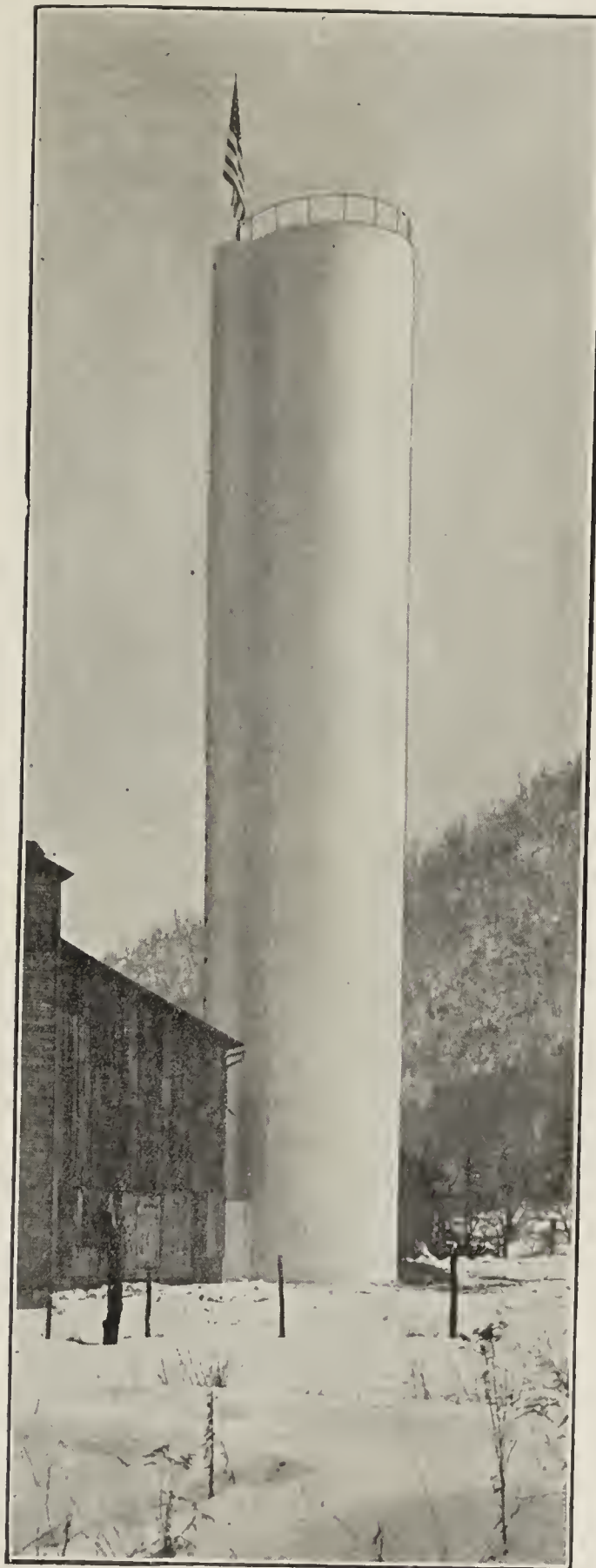
The concrete should be dumped, not thrown or dropped from a height, as this tends to separate the stone from the mortar. No concrete should be placed upon a dry sub-grade. If this precaution is not taken it is certain that the porous material, absorbing a considerable quantity of water, will rob the concrete of much of the moisture it needs for proper crystallization and curing. The inspector should make certain that the specified proportions are accurately and uniformly adhered to. Mortar should be thoroughly mixed and not allowed to look raw when deposited on the concrete base. If the mortar is not uniformly mixed, the surface will be irregularly colored and will contain pitted and honeycombed spots. Variable proportions of water should be avoided. A mortar mixed dry gives a darker finish than a wet one. The opposite sides of a stretch of walk will frequently appear to be of different shades, as the result of half of it being finished from one side, while the other half was finished from the opposite side.

The character of the finishing tool used in troweling the surface will affect the color or shade of the walk. A steel trowel gives a darker finish than a wooden trowel or float. If the top mortar is allowed to become too dry after being floated, and then finished with a steel trowel, it is apt to contain blotches, which remain indefinitely. The best mixers for mixing concrete for sidewalk construction are made by the Van Duzen-Roys Company, fourth floor, Hartman Building, Columbus, Ohio; American Cement Machine Company, 9635 Johnson street, Keokuk, Iowa, and W. E. Dunn Mfg. Company, 4139 Fillmore street, Chicago.

TALLEST SILO IN THE WORLD

The silo illustrated on this page is the tallest silo in the world. It is constructed entirely of concrete, with concrete chute. The dimensions is 16x108 feet. It was built by the Quality Farm Products Company of Salona, Pa., and is situated at a creamery near that city.

The Polk System Silo equipment complete was used in its construction. This job is really a remarkable



The Tallest Silo in the World.

A Polk System Structure, 16x108 Feet, Built by the Quality Farm Products Company, of Salona, Pa.

one. The circle at the top and bottom and any place between is perfect and its perpendicularity is accurate to a nicety. Another pertinent point is that the photo from which the cut was made was not retouched—so the print shows an exact likeness.

TESTING CONCRETE AGGREGATES—A PLEA FOR A RATIONAL METHOD.

Concrete has been used as a material of construction for more than 2,000 years, yet like other engineering materials specifications and methods of test to differentiate it are of recent origin. Moreover, specifications and tests have been developed only for the cement, and even they are imperfect and in some respects misleading. The fine and coarse aggregates and the finished product still lack the dignity which attaches to a material of which it may be said that "it conforms to specifications." Why this is so it would be difficult to explain. Possibly familiarity with common sand and stone has bred a contempt for them. Having been led into many serious difficulties, and having sustained financial losses in some cases through failure to consider properly the quality of the fine and coarse aggregates, there has now been awakened an interest in these matters which may in time produce the much needed standard specifications for these materials. One society, the American Concrete Institute, has had a committee at work on the subject for two years, and another society, the American Society for Testing Materials, has recently appointed a committee to take up the subject. These two bodies should, and undoubtedly will, work together, but the ground is comparatively new, and a great deal of underbrush will have to be cleared away before much progress can be made on the main problem.

From time to time articles on the testing of sand and aggregate have been published in this journal, but as no concerted or systematic action has been taken by bodies whose recommendation would be accepted, we are still without any method of test which may be called "standard."

In view of the present unsettled state as regards these matters and of the present prospect of securing co-operation between the committees named, it may not be amiss to discuss some of the points to be considered in drawing up a standard specification for aggregates, fine and coarse, and in devising the proper methods for testing them.

The matter of methods of test is of first importance. They must be standardized before specifications can be drawn. It is useless to specify the qualities that a material must possess, or the extent to which it must possess them, without deciding first on the manner of measurement. At present it is not unusual to see a specification which states that the sand "shall be clean, sharp, silicious material, free from loam or other deleterious matter." That is a good specification, except that many first class sands would fail to pass on every count. Few sands are perfectly "clean," while a rounded sand is better than a sharp one, if by "sharp" is meant "angular" or "having sharp edges." Some almost non-silicious sands are better than some almost purely silicious. A little loam or extremely fine material is often beneficial, and lastly—what matters are deleterious? The whole specification reminds one of the weather-beaten story of the student in natural history, who, when asked to describe a lobster, said that "it is a red fish which goes backward." "Right," said the professor, "except that it is not red, is not a fish, and does not go backward."

Concrete aggregates are often tested in the laboratory for such qualities as tensile and compressive strength, percentage of voids, granulometric analysis, weight per cubic foot, specific gravity, increase in volume of mortar mixtures, etc., to the number of about twenty, when really there are only two or three qualities which they are called upon to possess in practice; namely, that when mixed with Portland cement in the proper proportion the resulting mixture shall

have the required compressive strength, or impermeability or resistance to wear.

The qualities to be determined in the laboratory and those required in actual service should be either identical or so related that one may be derived from the other. For instance, if a definite relation existed between the tensile and compressive strengths of mortars, it might be admissible to make the simpler and easier tensile test in the laboratory and interpret the results in terms of compressive strength. But unfortunately no such definite relation exists, and if we want to know the compressive strength of a concrete or mortar we must test it in compression. Why not begin with the compression test and get directly the information desired? Or, if the concrete or mortar is to be used as a wearing surface, why not begin, and perhaps end, our tests with a determination of the quality it is essential that the material possess? The same applies to permeability.

When an engineer is called upon to decide which of several available concrete materials shall be used on a particular job for a particular purpose he must first decide which of the materials will produce most economically a concrete possessing the desired qualities in the required degree. Such a decision involves



Detail of All-Concrete Stairway, Resler Building.

the proportion of the mixture, and there appears to be no way at present to secure the data necessary for the passing of safe judgment without actual test for the particular quality in question. A knowledge of the percentage of voids or of some other quality in an aggregate may be interesting, and sometimes important, but it does not always tell the engineer in what proportions to mix his concrete in order to get a compressive strength of, say, 3,000 lb. per square inch in 28 days or an absorption of 5 per cent or less at an equal period or a wearing surface suitable for a power house or factory floor. Just what the chances for error are can be appreciated by a reading of the discussion on the proportioning of aggregates, which appears elsewhere in this issue.

It is to be hoped that as a result of the present widespread interest a method of testing aggregates will be developed which is more rational and direct than is our present method of testing Portland cement. [Engineering Record.]

REINFORCED CONCRETE BUILDING

The five story and basement reinforced concrete building of Philip Resler & Son, Minneapolis, shows the modern tendency in design for light manufacturing purposes. Concrete has been used not only for columns, girders and floors, but for stairways, including the balustrades and newels and for the structural framing of the show windows.

The building was designed by J. E. Nason, architect, and C. A. P. Turner, engineer, and built by James Leck & Company, contractors, all of Minneapolis. It is 52 by 110 feet in plan, and designed to carry three additional stories.



Diagonal Girders in Basement, Resler Building.

The perfection of fire-proofing is shown in the stairway, which consists of reinforced concrete stairs, balusters and newels, and while the problem of building forms was somewhat difficult, the cost is stated to have been lower than would have been the case with a cast-iron stairway of the usual pattern. Safety treads were placed on the steps at the time of concreting.

It was desirable that daylight should be admitted to the basement, which was to be used as a storeroom, and to accomplish this a bulkhead wall of concrete forms the front of the show windows. This permitted glazing the area between the ground level and the show-window floor, which gives adequate lighting for the basement. This required some additional framing and the accompanying illustration shows a diagonal beam which takes a considerable part of the load off the bulkhead girder.

While this building is severe in its lines, it is admirably adapted to the purpose of manufacturing and wholesaling, and the safety of the occupants against fire is assured by both material and design.

CONCRETE TROLLEY POLES

In certain sections of Cleveland, a city ordinance prohibited further erection of wood poles and required also that all poles be removed within two years and wires placed below ground. There were already about 50 octagonal concrete poles in service in the city and these had attracted so much favorable comment because of their uniform drab color and straight lines, that the company obtained permission to leave wires above ground providing concrete poles were installed.

After two years of use there are now 750 concrete poles in service, largely replacing wood poles in outlying districts and being used in practically all new work.

The standard concrete pole is 28 feet long, 11 inches in diameter at the butt and 6 inches at the top, and is octagonal in shape starting 6 feet from the

square butt. The weight is 1700 lbs., and when set 6 feet in the ground withstands a 500-pound pull at the top. The cost of manufacture is \$12.00. Porcelain insulators safe for 6000 volts are used in order that no electrolysis effects may occur.

The reinforcement consists of 8 $\frac{5}{8}$ -inch square twisted bars placed so that the center line of the steel is 1 inch from the concrete surface. A very rich and wet mixture is used and the aggregate is proportioned for maximum density, being tested frequently during construction. The poles are kept continually and uniformly wet through a period of 28 days.

The forms consist of two steel channels pressed from heavy sheets with a varying width, which are held by eight U-shaped rods passing through the flanges. The form rests on a wood pallet and wood strips are inserted to obtain the bevelled edges. The upper surface is trowelled smooth.

The poles are superior in every way to wood poles, are cheaper than tubular steel poles, require little or no maintenance and are received favorably by the public. Their use is now standard practice in the city of Cleveland.



Typical Cleveland Trolley Pole of Concrete.

The design and construction of these poles was in charge of C. H. Clark, Engineer for the Cleveland Railway Co., and L. P. Crecelius, Supt. of Motive Power.

Fort Wayne, Ind., is having equal success with concrete poles. The situation there is summed up in a letter from J. J. Brennan, Fort Wayne, Ind., Supt. of Maintenance of Way of the Fort Wayne and No. Indiana Traction Co., which we publish herewith.

"Replying to your letter relative to concrete poles in Fort Wayne, beg to advise that we have quite a large number of these poles in use at the present time, and contemplate using this type altogether in the future. Many of our poles were erected about four

years ago and only two have broken to date, and they had very good reasons for so doing. One was run into by a switch engine and the other run up against by two or three wagons. We are perfectly satisfied with this type of pole."

The Fort Wayne concrete poles are excellent in appearance and their clean, straight lines are in

for a lawn party it forms an attractive bower for serving afternoon tea, but is equally delightful as a sequestered nook to pass a quiet hour in a hammock within its refreshing shade.

The stately pergola shown here was erected for Dr. J. D. Roberts, of Terre Haute, Ind., and was designed and manufactured by The Pettyjohn Company, also of



Concrete Pergola, Terre Haute, Ind.

marked contrast to the wooden poles used for telephone and lighting purposes on the same street.

CONCRETE PERGOLA

A properly designed pergola adds an indescribable charm to the lawn or garden. It is the finishing touch to the architectural perfection of elaborate grounds and at the same time confirms the artistic character of the

Terre Haute, and Medusa white Portland cement and Medusa waterproofing were used in the construction. These pergolas are all concrete, including columns, girders and cross beams, and are therefore all-enduring.

STUCCO RESIDENCES IN DENVER

The attractiveness and beauty of white Portland cement is exemplified in the construction of the resi-



Stucco Residence of Dr. A. L. Kennedy, Denver, Colorado.

modest home. They are equally useful as a dainty frame for a bower of roses or in the more humble mission of supporting the rugged twisting vines of the grape.

The pergola is by no means solely ornamental, but serves many useful purposes. As the central feature

dences of Mrs. C. L. Wellington, Bartlett Richards, Dr. A. L. Kennedy and H. S. Walker, of Denver, Colorado, illustrated herewith.

In each case white Portland cement was used for the exterior finish as a skim coat over a first coat of ordinary Portland cement and a wall of common brick.



Stucco Residence of H. S. Walker, Denver Colorado.

In some cases the joints were raked out before plastering was applied, and in others they were not, and results seem to be the same. In every instance the

the most beautiful she had ever seen, and to Biscoe & Hewitt, architects of Denver, great credit is due for excellency in design and selection of materials in these



Stucco Residence of Mrs. C. L. Wellington, Denver, Colorado.

white cement was tinted slightly with yellow ochre or Indian red or a combination of the two, the resultant color being a warm cream white. All residences were given a coarse float finish.

residences. Medusa White Portland Cement was used in these residences.

R. Pedersen was contractor for Wellington and Richards residences, Trumbull-Barnard Building Co.,



Stucco Residence of Bartlett Richards, Denver, Colorado.

Miss Julia Marlowe, the celebrated actress, declared the residence of Mrs. C. L. Wellington, to be one of

for Kennedy house, and Desjardins & Hardy, contractors for Walker residence, all of Denver.

CIRCULAR CONCRETE WATER TROUGH

Wood was good enough before concrete was known but wood has outlived its usefulness for such an important structure as the barnyard trough.

There are many shapes and kinds of watering troughs. The most attractive in appearance is the

together. Also the feed room connecting the twin silos together with its roof are all of reinforced concrete, having been joined to the silos proper as they were built. The mixture was one part Medusa Portland Cement, two parts sand, and three parts crushed limestone. Mr. Kuharske has built many silos around



A Circular Concrete Trough Looks and Lasts Well.

circular trough, but this is a little harder to build than one of rectangular shape. On this page is shown a tank on the farm of Watkin Jones, near Pickett, Wis. This structure was built by farm labor, and is filled from a well by a pump operated by windmill. It is one of many concrete improvements on this farm.

Rockford, Stillman Valley, Pecatonica and Savannah. Steel forms for building monolithic concrete silos are manufactured and sold by the Conklin Construction Co., 430 Main St., Hartford, Mich., and also by Polk-Genung-Polk Co., Fort Branch, Ind.

CONCRETE SILOS

The concrete twin silos on the "Overlook Dairy Farm" near Rockford, Illinois, are on the property

CONCRETE HORSE BARN

The concrete horse barn on the farm of E. A. Kuharske, of Rockford, Ill., which was designed and built by him, is the largest of its kind in the vicinity of Rockford, and there perhaps is no similar structure



Silos on "Overlook Dairy Farm," Rockford, Illinois.

of C. W. & R. H. Jones, who operate a sanitary dairy business, delivering milk in Rockford from tested cows.

These silos were designed and built by E. A. Kuharske, of Rockford, Ill., with Polk forms, and are entirely of concrete, of the monolithic type,—that is the roof and chute as well as silo proper are all cast

in that part of the country. It is indeed a model, having many stalls both of the ordinary and box type with the latest sanitary features.

The second floor is arranged with rooms for the workmen to live in. Feed racks, water troughs, partitions, plain feed boxes, cupola, and grain bins are all of concrete, no wood whatever having been used

in the entire structure except for the doors, and they were afterwards tinned on the outside to render them fire-proof.

Mr. Kuharske used Medusa White Portland Cement for exterior and interior finish of this barn.

CONCRETE POSTS AND BALUSTRADE

The Kensington estate is located at Great Neck, Long Island, New York, and the entrance to this estate is formed by a center gate or driveway about 16 feet wide, flanked on each side by a smaller gate, about 6 feet wide, for pedestrians, with large entrance posts

kind that has so far been built entirely of white cement cast stone.

CONCRETE FOR THE CORN CRIB

Rats generally make their headquarters in the corn crib, but the farmer can build his crib of materials into which rats cannot gnaw. This is a long step toward the extermination of these pests.

There is no accepted type of corn crib. Every farmer builds to suit his own ideas. In general, for good ventilation, cribs are not built more than 8 feet through, but the walls may be vertical or sloped, high



Concrete Horse Barn, Rockford, Illinois.

4 feet square and over 20 feet high, and a balustrade 7 feet high. Total width of gates and balustrade is about 300 feet, part of balustrade being on a radius.

The main entrance posts are surmounted by enormous lanterns, with filigree panels to emit the light, and the shafts of posts are embellished with the coat of arms of the Kensington estate. In a niche or recess formed to the left of the side entrance is placed a massive stone bench. The entire work was built with Medusa white Portland cement. It was designed by Alfred Hopkins, 11 East 24th street, New York City,

or low, according to the wish of the farmer. One fact, however, is settled and that is that concrete floors alone will serve to keep moisture away from the corn, and rats from living beneath and coming through the floor.

One of the most unique corn cribs ever built stands on the farm of Tjernagel Brothers of Story City, Iowa. The building is quite imposing, 48 feet long by 31 feet wide, has two cribs 8 feet wide, the full length of the building, and is 22 feet high up to the purlins of the roof. The alley between is 15 feet wide and gives



Concrete Posts and Balustrade on the Kensington Estate.

and built by Adolf Schilling, of Albany, N. Y., now manager of the Pompeian Stone Company, Haddon Heights, N. J.

The posts, base course, piers, and plain sections of balustrade were constructed in the rough with concrete hollow tile, and then finished with stucco made of 1 part cement and $2\frac{1}{2}$ parts white marble sand. The same mix was used for balusters, caps, copings, vases and lanterns, which were cast in gelatine molds and then placed in position.

This work is remarkable for its true execution of the well designed and elaborate detail in the ornamental portions, and is the most imposing structure of the

ample storage for thresher and other farm machinery. Bins above hold about 4000 bushels of oats.

The walls are of concrete, consisting of solid 16-inch columns, with a low perforated wall between columns and the space above closed by concrete fence posts, about 2 inches apart. The roof framing is of wood and there will shortly be a roof of cement tile. The owners planned the building and put it up with their own labor, paying only \$550 for lumber and cement and \$35 for reinforcing material.

For the benefit of those who want a building somewhat similar, the following description of the walls and how they were constructed is given.

First, the 16-inch columns were cast in wood forms which went down four feet into the ground and extended 12 feet above. The columns were reinforced with twisted steel rods and in the top of each was inserted an iron pin which anchored the roof timbers

CONCRETE BLOCK MUNICIPAL BUILDING

The village of Gaylord, Michigan, has the distinction of being the home of a genius in the building profession, and of possessing an enterprising and progressive community. Quite recently it was decided to erect



Unique Concrete Corn Crib near Story City, Iowa.

to the columns. When the twenty columns were complete, a form was made up for a single section of the perforated wall between columns. This part consisted of a 12-inch curtain going down $3\frac{1}{2}$ feet into the ground and extending one foot above ground; a panel 7 inches thick having holes left at frequent intervals, and on top of this a 6x12-inch sill.

a municipal building of modern and fireproof type, and Mr. J. Frederickson of Gaylord, architect and builder, who makes concrete work a specialty, was chosen to take charge of the work.

The building is 62 feet wide by 105 feet long, and contains the village council rooms, fire department and opera house, the latter having a seating capacity



Municipal Building, Gaylord, Michigan.
The Construction Is of Concrete Blocks.

The fence posts, identical with those used elsewhere on the farm, were 7 feet long, 5 inches in diameter at the bottom and 3 inches at the top. A groove in the sill received the 5-inch ends and they were held securely by filling the groove with cement mortar. The upper ends of the posts were bolted to beams running from column to column.

When one panel had been finished the form was moved to the next and so on until the entire series was complete. Finally the roof timbers were set up and a tarpaper roof added which will later be covered with cement tile.

of 600 and a stage 22 feet by 60 feet. The construction is of concrete blocks with a continuous 2 inch hollow air space, and it required 17,000 blocks besides the monolithic castings to complete the building. The outside blocks are 4"x8"x16" and the inside blocks 8"x8"x16", and each and every block is reinforced with two $\frac{1}{4}$ " Ransom twisted bars.

Mr. Frederickson, who is experienced in concrete, mason and carpenter work, erected the entire front of building personally, including the laying of blocks and making of forms and monolithic castings, using Medusa White Portland Cement for facing of blocks.

The panels of the pediment are bush-hammered and the lettering was executed in cement by Mr. Frederickson.

This is a very noteworthy example of concrete work, and demonstrates the artistic effects which can be produced by the use of white Portland cement in concrete blocks.

few times. But where no contractor is near it will pay to buy a block machine and use spare time in making the best of all farm building materials — concrete blocks.

CONCRETE BLOCK BANK BUILDING

Very few concrete block buildings can compare favorably with the Waynoka State Bank building,



A Farm Home of Concrete Blocks near Burlington Wisconsin.

CONCRETE BLOCK FARM DWELLINGS

While concrete blocks are useful for the barn, small buildings and silos, they are equally good for the farm house. They require a little greater care on the part of the block maker, but the farmer who has had the experience in making them for his small buildings can

Waynoka, Oklahoma, and Mr. C. A. Hite, superintendent of the block construction, is being very highly complimented on his work by men from all parts of the country. The building is 25 feet by 60, faced on two ends and one side, and cost \$10,000 complete.

The ground floor and partitions are of cement, and



Waynoka State Bank Building.
Constructed of Concrete Blocks.

readily make good enough material for his house. Many farmers have done just this and are proud of their work. The house shown on this page belongs to Mrs. Maud Fredrickson, whose farm lies near Burlington, Wis.

In general, it pays to hire a contractor for large work. He is doing every day what the farmer does a

vault on lower floor of concrete blocks. There are 10,000 blocks in the building, these having been made during the winter, using steam for curing. The mixture was 1 cement, 3 sand and 3 crushed rock. The facing of exterior blocks contain 1 part Medusa white Portland cement, 1 white sand and 1 marble dust, with 2 per cent Medusa waterproofing.

CONCRETE GRAIN ELEVATOR

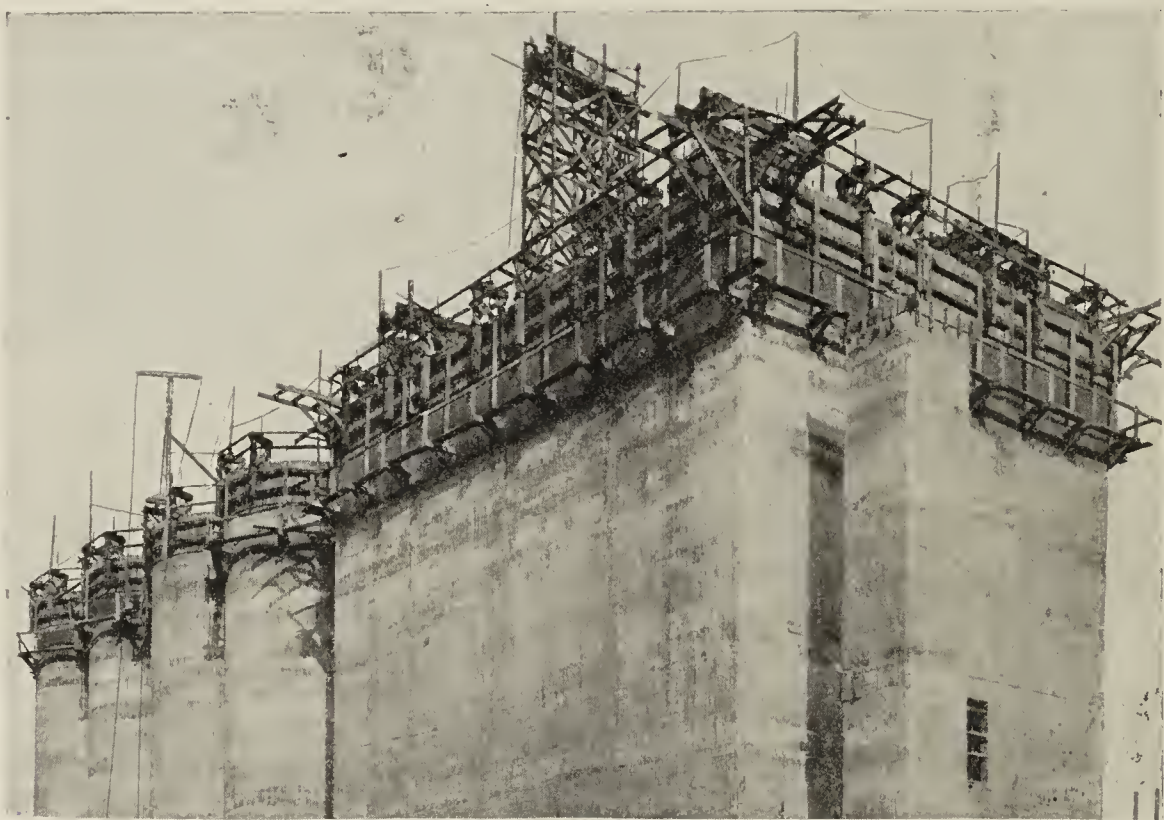
Construction cost must always be the determining factor in the choice of materials for grain elevators. Certain requisites as to design, permanence, freedom from fire danger and appearance can be met by several types of materials and that type is chosen which fulfills the requirements most reasonably. Before the use of sliding forms was developed it was difficult to cast grain tanks with clean homogeneous walls but today they are common in the Northwest and as construction methods are perfected to a still greater degree, will eventually become the standard type. Such is almost the case today, if new construction may be used as a criterion.

The new reinforced grain elevator illustrated herewith belongs to the Chicago, Indiana and Southern Ry., and is located at Schneider, Ind. The plant consists of a work house, eight storage tanks, drier building, a bleacher tower and a powerhouse all of rein-

concreting was 8 feet, which was reduced to 4 feet during cold weather. A scaffold was suspended from the forms so that the freshly exposed surfaces could be cleaned and floated with grout. The bin walls are 7 inches thick, the work house walls 8 inches and the bleacher tower wall 6 inches. A total of 5,000 yards of concrete was involved in the several buildings and tank. The contractor was the Stephens Engineering Co. of Chicago.

A LARGE SAND AND GRAVEL PLANT

The Joliet Sand & Gravel Company of Chicago has a large plant, about four miles from Joliet, Illinois, near the Illinois River and on the main line of the Rock Island Railroad, for preparing gravel for concrete and other commercial purposes, and for railroad ballast. It is considered to be one of the largest gravel washing plants in the country, having a daily capacity from 2,500 to 3,000 yards of washed gravel per day.



Work House Under Construction and Detail of Sliding.

forced concrete. The work house is 42x175 feet high and contains 15 square and rectangular bins 56 feet deep with an approximate total capacity of 80,000 bushels. The cupola surmounting the bins is 72 feet high and divided into four floors, the bin, scale, garner and top floors.

The work house will be used for receiving, weighing, cleaning, transferring and mixing grain, which will be handled by five elevators of a total capacity of 12,600 bushels per hour. The eight 20-foot storage bins are each 76 feet high and have a total capacity of 170,000 bushels. The drier building is 27x32x52 feet high, the bleacher tower 6x6x62 feet high and the power house is 39x47x20 feet high.

A track shed 30x84 feet extends over the two tracks on the west side of the work house and affords a shelter to the receiving pits under the first track and for the shipping spouts and loaders serving cars on the second track. A very complete equipment of screw and belt conveyors connects the work house with the bins, the drier and the track shed. All the conveyor machinery (furnished by Weller Mfg. Co., Chicago) is operated by rope drive from the power plant.

The walls of the bins as well as the rectangular buildings were poured between sliding wood forms 4 feet high which were moved continuously during concreting. The outer forms were lined with metal in order to give a smoother surface. A maximum day's

In addition to its unusual size, there are a number of special features incorporated in the design of the plant which add considerably to the efficiency. One of the unusual features in the design is the arrangement which provides for making a preliminary separation, and crushing the larger sizes before being delivered to the washing plant. By thus dry crushing the larger sizes rather than passing them directly to the screens a greater capacity and less depreciation is secured from the gyratory crushers and there is also secured greater capacity from the screens. This is due to the lumps of clay, etc., being broken up in the crusher, allowing them no opportunity to clog the machinery. Such oversize as is rejected from the plant is then easily handled by disc crushers.

The general arrangement of the plant is illustrated below. The receiving hopper is located near to the plant, so that it may also receive the over-size from the screens and thus eliminate an extra conveyor as well as spreading the plant over less ground. A 36-inch belt conveyor, 195 feet centers, receives the bank gravel from the track hopper and carries it up an 18-degree incline to the dry crushing plant. This conveyor discharges over a 4-inch screen which allows the fines to pass directly to Conveyor No. 2 while the over-size is passed through a pair of No. 6 Allis-Chalmers Gyratory Crushers, driven by individual 50 horse-power Allis-Chalmers Motors. The

foundations have been placed here for two additional crushers which will be installed whenever the capacity must be still further increased. Conveyor No. 2 is 36 inches in width, 250 feet centers, and rises to the washing plant on an incline of 18 degrees.

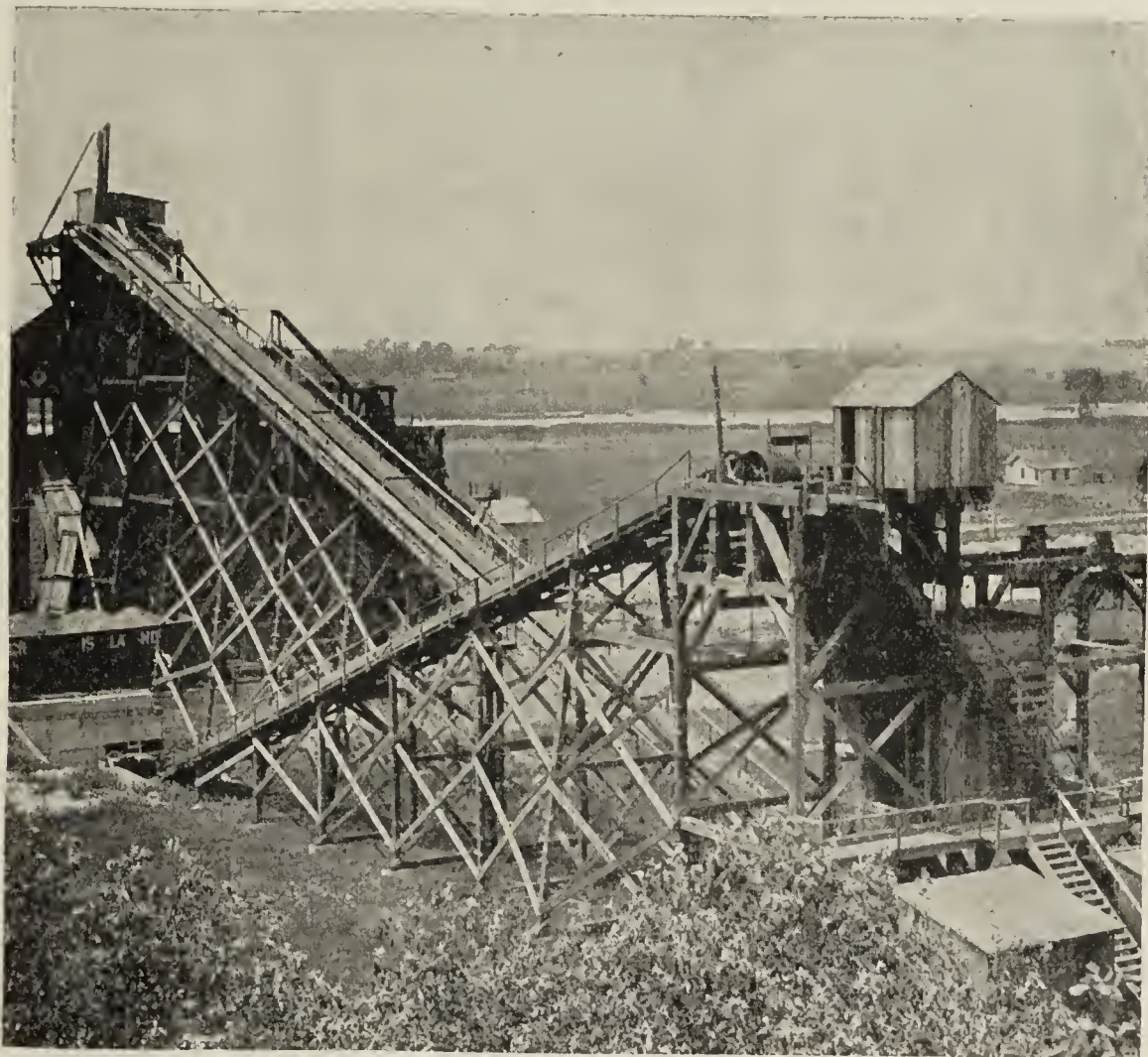
Both conveyors are driven by individual motors.

The screening plant proper is divided into two parts, one for dry screening for railroad ballast and one for washing and screening for producing commercial gravel for concrete purposes. Conveyor No. 2 ordinarily discharges direct to the hopper feeding the washing screens but when it is desired to screen dry, a pivoted chute may be let down into the stream of gravel so as to divert any or all to the two cylindrical screens for dry screening. These screens are provided with 2-inch perforations. The fines drop below into the storage bin and the over-size is rejected to a spout leading over the loading track and delivering to a pair of 36-inch crushers. These crushers are located directly beside the track hopper and their rejections pass into the hopper and are again passed through the dry crushing plant and carried up to the screens.

No. 3, all over $\frac{1}{2}$ inch, and the fourth set rejects to Bin No. 4 all over $\frac{3}{8}$ inches. Below $\frac{3}{8}$ inches, constitutes sand which is passed from the settling tanks to Bin No. 5.

The storage tanks or bins are of a type which in the experience of this company have proven of greatest economy for a permanent plant. These bins are cylindrical steel tanks which serve as supports for the screening plant. Tracks run along each side of these bins and each one is provided with four quadrant type gates with counterweighted chutes for loading into gondola cars. The tanks are not hoppered, but the gravel is allowed to form its own bottom at the level of the gates. The bins are all 19 feet in diameter and the effective capacity (above the gates) of each bin, is 380 cubic yards each for Bins Nos. 1 and 2, 315 cubic yards for No. 3, 251 for No. 4, and No. 5 or the sand tank holds 190 cubic yards.

The water supply is secured from a trench near the plant, excavated by one of the steam shovels to a depth of fifteen feet and for a length of about one hundred feet. Sufficient water accumulates in this



Joliet Sand and Gravel Plant.

Gates Crushers, Symons Disc Crushers, Belt Conveyors, Centrifugal Pumps, Rotary Screens, Etc., Driven by Individual Motors.

Three sets of washing screens are provided for the first three separations and the reduced volume of the gravel passing to the fourth separation requires but two screens. These final screens deliver into a pair of double discharge settling tanks in which the sand is separated from the mud and clay which is passed off in solution. Each screen of the first three sets is provided with an inner skirt with perforations $\frac{1}{4}$ -inch larger than those of the outer plate. This skirt extends nearly the length of the main screen plate and practically doubles the screen's capacity by relieving it of the larger sizes, as well as making more accurate separations. The sizes produced by these screens are those demanded by the market of Chicago and vicinity. The first set of screens rejects to the chute leading over to the recrushers all material passing $2\frac{1}{4}$ -inch perforations. The second set of screens rejects to Bin No. 2 all above $1\frac{1}{4}$ inches, the third set, to Bin

trench to supply the plant and obviates the necessity of running an expensive pipe line to the river. A Morris centrifugal pump, driven by an individual 50 horse-power motor, delivers water to the screens at the rate of 1,200 gallons per minute.

This plant is situated particularly fortunately for power, which it secures from the Public Service Corporation of Northern Illinois. This is delivered to the plant at 8,000 volts, which is stepped down in transformers to 440. Individual electric drives are used throughout the plant for all machinery, so that any portion of the plant may run independently of the rest. A complete system of electric signal bells covers the plant, which assists in the operation and control of the various units.

The deposit of gravel is of a peculiar formation. The gravel bank extends in a general east and west direction for a distance of one and three-quarters miles,

attaining a width of about three-quarters of a mile at the center and tapering off to a point at each end. It is comparatively level on the top and has an average height of sixty to eighty feet. The area covered by this bank is 460 acres, so that even without excavating below the ground level sufficient gravel can be secured from the bank to operate the plant for years to come.

The method of excavating is by means of steam shovels, which deliver to standard gauge hopper cars.

L. S. & M. S. and Toledo Terminal railroads, over which sand is rerouted from Toledo.

FREIGHT RATES ON SAND

One of the largest suits for damages for alleged rate discrimination ever filed against a railroad in Texas is that which the Wagner Sand Company, San Antonio, Texas, has instituted in the District Court against the San Antonio & Aransas Pass. The plain-



One of the 70-Ton Bucyrus Steam Shovels in the Plant of the Joliet Sand & Gravel Company.

These are hauled to the plant in trains of five or six and are dumped directly into the large receiving hopper. Two seventy-ton shovels having a combined capacity of 5,000 yards per day, are in operation at the present time.

FREIGHT RATES ON SAND

The Toledo Owens Glass Sand Co., Toledo, O., asked the state utilities commission to refuse the Toledo, Angola & Western railway permission to

tiff company has sued to recover \$1,235,070 damages, this sum being made up of losses which it alleges it has sustained as a result of the railroad refusing to haul sand from its pit free while it performs this identical service without cost to two other sand companies located adjacent to the road. The petition also makes a plea that an order be issued by the court requiring the railroad to haul the plaintiff company's sand free, or, if this is not done, that an injunction be issued restraining the railroad from hauling the sand of the competing companies without charge.



General View of the Joliet Sand and Gravel Company.

advance the rate for shipping sand from Silica to Toledo from 30 to 32 cents per ton, claiming the advanced rate would not allow it to compete successfully with sand manufacturers in West Virginia and Pennsylvania.

Tariffs show the railway has steadily increased the rate on sand from Silica to Toledo from 20 cents a ton in 1910 to 25 cents in 1912, and 30 cents in 1913.

The interstate commerce commission recently authorized an increase of 5 per cent in interstate traffic, but not in intrastate traffic.

The sand company names as co-defendants the C., H. & D., Hocking Valley, T. & O. C., Big Four, Pennsylvania, W. & L. E., T., St. L. & Western, Wabash,

HOW TO TEST IOWA GRAVELS

While Iowa has large gravel deposits which may be used to make concrete for all building purposes, there is such a variation in the amount and character of sand these deposits contain, that it is well to test all Iowa gravels in order to obtain a uniform quality in the concrete produced.

Detailed information about the various grades of gravel in Iowa, together with specific information for testing, including a simple testing apparatus such as is used by the Iowa Highway Commission, is contained in a bulletin, "The Use of Iowa Gravel for Concrete," issued by the state engineering experiment station at Ames, Dean A. Marston, director.

HYDRATED LIME

By W. B. Joseph, Wilmington, Del.

The manufacture of lime in the United States is a large, important, and rapidly growing industry. Few mineral products have so wide and important varieties of uses as lime. A little more than half the lime manufactured in the United States is used as a structural material, and the remainder for agricultural and chemical purposes. The principal uses of lime in building operations are in the lime mortars and plasters, in gauging Portland cement mortars, concrete, etc. The special advantages of hydrated lime related to those features of interest to civil engineers will be developed in this article.

Hydrated lime is, chemically speaking, calcium hydroxide, $\text{Ca}(\text{OH})_2$, being a compound formed by the chemical union of CaO (lime) with water. Commercially the term hydrated lime is restricted to the dry powder prepared by mechanically treating quick lime with sufficient water to combine with all the calcium oxide present.

In the preparation of hydrated lime only two materials are used, fresh caustic lime and water. The first step in the process is to reduce the lumps of lime by crushing to about one half inch size; sometimes this reduction is carried further by grinding the lime to about the fineness of granulated sugar. The granulated or crushed lime is then treated with sufficient water to chemically combine with the calcium oxide in the lime, care being taken that the amount is neither too little to satisfy the chemical requirements, nor so great as to leave the hydrated mass wet or damp. In practice an excess of water is used, this excess being driven off by the heat generated in the slaking of the lime.

Three different methods of manufacture are in extensive use in the preparation of hydrated lime in this country. In the Clyde or batch method a weighed quantity of cracked or ground lime is fed from a scale hopper into a large horizontal pan. This pan is mounted so that it can be rotated about its vertical axis, and there are a series of plows arranged to turn over and mix the material in the pan. To the weighed amount of lime a pre-determined quantity of water is added and the whole mass agitated by revolving the pan. In this method of hydrating, it is the general practice of the manufacturer to take the hydrate directly from the pan and store it in bins to age the product, although many others finish the product at once.

In the Kritzer, or continuous, method the cracked or ground lime is fed into the upper one of a series of enclosed cylinders mounted one on top of the other. The feed is so arranged as to be uniform, and a uniform amount of water is added to the upper cylinder by means of a perforated pipe. The mixed lime and water are propelled throughout the series of cylinders through the cylinder, and the shaft is rotated by gearing on the outside. Both materials are thus carried through the whole series of from four to six cylinders, and the product is discharged from the lower or last cylinder thoroughly hydrated. This method of manufacture is subject to the usual objection of all continuous mixing processes, namely that of the impossibility of controlling exactly the relative proportions of the ingredients being mixed.

In the combination batch and continuous method a weighed amount of lime is introduced into the upper end of a rotating cylinder similar to a cement kiln or rotary sand drier, which is slightly inclined from the horizontal. A sufficient amount of water is added, and the material is agitated by the action of the cylinder.

Inside the cylinder are a number of encircling rings which tend to retard the flow of the lime towards the discharge end. The lighter particles of hydrate rise and pass over the retarding rings, while the heavier unhydrated particles are retained until the hydration is complete.

These three methods are in general use in this country at the present time. In most plants the lime after being hydrated is subsequently treated to remove any impurities, such as unhydrated lime, core, sand, etc., that may be present. This is best done by air separation in which the fine perfectly hydrated particles of lime are carried in suspension by an air current, and subsequently collected in some form of collector, the coarser and heavier particles being removed from the hydrate and discarded. The thoroughly hydrated portion is then packed for shipment in bags or sacks, the same as cement.

This description will give some idea of the care necessary to prepare a good grade of hydrated lime from a quick lime. Since it requires great care and extra machinery in the preparation of this hydrate, it must possess certain properties making it more useful and valuable to builders than the ordinary quick lime. The most important characteristic is the increase in strength resulting from the hydration of lime; this feature will be developed more fully later on. Probably the first characteristic property to be noticed is the ease with which hydrated lime can be packed and shipped. Quick lime cannot be shipped in either cloth or paper bags but, in small lots, must be packed in barrels. If left in these barrels any length of time, the lime usually slakes to some extent and swells, causing the bursting of barrels. There is always the danger of fire where quick lime is in contact with wood because if water gets to the lime, heat will be developed in slaking and any wood in contact with the lime will be set on fire. Hydrated lime on the other hand is shipped in bags the same as cement, making it easy to handle for both the dealer and the manufacturer.

Again hydrated lime is a fixed product which does not deteriorate with age, and therefore may be conveniently stored at either the plant or dealer's warehouse. This cannot be done with quick lime, which will rapidly air slake and change to the carbonate when the attempt is made to keep quick lime any length of time. Hydrated lime is consequently always worth the market price of this product, while quick lime is continually decreasing in value.

It has long been known that additions of lime improved in a great many ways cement mortars, notably the trowelling and waterproofing qualities of these latter. Since hydrated lime comes on the market as a very fine, dry powder it can very conveniently be mixed with cement. It is usually employed in proportions of about 15 parts of lime to 85 parts of cement, or 15% of the cement is replaced with lime; hence for each bag of cement used, seventeen pounds of hydrated lime are added, the mixture thus making as much concrete as 1.2 bags of cement. The addition of this lime to the cement has several other important advantages. Chief of these is its waterproofing qualities. The theory is very simple. Hydrate of lime is an extremely fine material, being much finer than the finest Portland cement; hence the material fills the voids in the concrete mass, making a denser and therefore more nearly waterproof substance. Most waterproofing materials have an organic base, and therefore are ultimately subject to decay and disintegration. While these organic salts at first render concrete watertight, in time through decay they leave the mass as porous as it would have been had no waterproofing

compound been added. Hydrated lime is practically pure calcium hydrate, is of mineral nature, contains no organic material and is, therefore, not subject to decay or disintegration. The great advantage accruing in using hydrated lime as a waterproofing material over other substances lies in the fact that while these latter decrease the ultimate strength of the cement from 5% to 20%, the hydrated lime does not decrease it at all, but rather increases it. The following tests were made, the strength noted in every case being the average of five briquettes broken:

	24 hours	7 days	28 days
Cement (neat)	332 lbs.	690 lbs.	736 lbs.
Cement 95%, lime 5%....	216 lbs.	671 lbs.	853 lbs.

Thus it can very readily be seen from the twenty-eight days' test that after the initial stages of setting had been passed the substitution of the hydrated lime increased the ultimate strength of the mass considerably.

Hydrated lime when added to Portland cement also makes the color of the finished product lighter. When work is well done and well finished the color should be a light gray. By the addition of about 10% lime the color is lightened several shades, and this addition is particularly useful in overcoming any darkening color in the sand. Hydrated lime also prevents rapid drying out in concrete. This tendency of concrete to dry out is especially noticeable in hot and windy weather. To prevent this the work is either protected or more water is added; it is also sprinkled after it begins to harden. Hydrated lime when added prevents this; it has a tendency to hold the moisture in the mass.

All lime mortars whether they contain Portland cement or not, are stronger when prepared from hydrated lime than when prepared from quick lime. Mortars made from dolomitic limes are stronger at the end of one year than high calcium limes. It is sometimes claimed that limes made from dolomitic limestone are unsuited for use in mortars containing Portland cement because of their high magnesium content. The results given from tests made under the supervision of the Charles Warner Co., Wilmington, Delaware, show no deleterious action from the magnesia, but on the contrary indicate that the magnesia is a valuable ingredient, contributing to the strength of the mortars.

At present there are no standards as to chemical analysis or fineness for hydrated limes, though this subject is now being taken up by the city of New York and by the American Society of Testing Materials. In general the hydrated limes on the market will be found to be of excellent quality for plastering and mortar work. In work requiring greater refinement, the engineer must consider three factors in the hydrated lime he proposes to use, (1) Carbon Dioxide content, (2) Free lime, and (3) Fineness.

Carbon Dioxide acts only as a diluent, rendering inert, however, approximately an equal weight of lime. A content of 4% of CO_2 which equals 8% CaCO_3 , MgCO_3 is a limit beyond which no hydrate should be acceptable. With care in manufacture the content of CO_2 is not likely to run over 2%. Some hydrates, particularly of the high calcium variety, have a tendency to take up CO_2 from the air, which may assume extreme proportions if the material has been warehoused too long, say over three months, or rehandled several times, which serves to stir up the mass and permit the infiltration of additional air. This results in a gain in weight so that the loss is not so serious as when the CO_2 is left in during process of manufacture. For this reason also, samples of hydrate that are col-

lected for testing should be at once placed in an airtight receptacle, such as a Mason jar, so that the sample cannot possibly suffer any degradation in absorbing CO_2 between the time of collecting and the time of testing. Likewise the samples should be taken well down into the center of the bag.

Free lime is likely to be the greatest menace that the engineer has to contend with. Many hydrates enjoying extensive use contain up to 2% free lime in a finely pulverized condition. For this reason it has come to be a custom of the trade that free lime to the extent of 2% is not injurious. This, however, has yet to be demonstrated by careful engineering tests. Since there are hydrates on the market which run a slight excess of free water, they are to be preferred when obtainable.

The chemist in analyzing for free lime must not fail to calculate for the lime held in combination, not only with the water, but also with CO_2 . Magnesia occurs only as the oxide so that its percentage is to be ignored in the calculation. As a further test, hydrated lime may be mixed with cement or Plaster of Paris which are known to be sound, sufficient to make a hard pat and subject it to the steam bath following the methods prescribed for boiling test for cement.

Fineness should be better than 96% through 100 mesh. It will usually be found to exceed 98%. In this respect there is little fault to be found with the hydrates on the market. It is unnecessary to test through a 200 mesh screen, as the very process of hydration has a tendency to reduce to molecular fineness.

HYDRATED LIME IN CONCRETE CONSTRUCTION

The walls of our new three-story fire-proof hydrating mill were built of concrete consisting of one part cement, one part hydrated lime measured dry, and six parts sand and gravel. At the end of four weeks these walls were so hard that it was with the utmost difficulty that holes could be drilled through them writes the Marblehead Lime Company of Chicago. The contractor who did the work is enthusiastic over the advantages of hydrated lime in Portland Cement mixtures. He insists that the concrete is much harder and tougher (as shown by the drillings) than can be made with cement alone. We know it is much more water-proof. He also says that the mortar is much more plastic and more easily and efficiently placed in forms. The floors are of concrete with one part hydrate to one part cement and four parts sand and gravel. We are now satisfied that we could have used double the proportion of hydrate we did in both walls and floors with even better results.

We used considerable iron reinforcements, which we are now satisfied was unnecessary. There is absolutely no doubt in our minds that the addition of certain proportions of high calcium hydrate to all concrete work greatly improves its quality and strength. The exact proportions advisable for different classes of work have not been definitely established by practical tests and experience, but that is a detail that will soon be worked out.

Hydrate lime certainly has a big future in Portland Cement Blocks as well as all concrete mixtures. It not only makes concrete more waterproof, but, up to a certain proportion stronger, tougher and more flexible. Besides it makes the cement mortar far more plastic and easier to work. Fully one-third, if not more of the Portland Cement now used could be substituted with high calcium hydrate with the greatest profit and satisfaction to all concerned.

Among The Cement Mills

PULVERIZED COAL BURNING IN THE CEMENT INDUSTRY

By R. C. Carpenter, Ithaca, N. Y.

For more than 30 years various schemes for burning powdered coal in boiler furnaces have been suggested and numerous patents have been taken out on various processes and burners, but without any marked degree of success. In the Portland cement industry commercial success was attained more than 15 years ago as a result of a series of investigations and experiments. The furnace employed had much to do with the practical success which was finally attained, and for that reason its construction and mode of operation will be briefly described. This furnace is familiar to Portland cement engineers, but is not well known in the other arts.

Portland cement is manufactured from a mixture of materials containing lime and silica which are brought together in definite proportions to produce a chemical combination. The raw material is principally carbonate of lime, or limestone in some form, and clay or shale. The materials are pulverized raw and mixed in proper proportions. The raw mix is introduced into a kiln either in the form of a dry powder or in a wet and plastic condition where it is subjected to an extremely high temperature and in which the required chemical combinations take place. The material discharged from the kiln is known as cement clinker; it is pulverized in various forms of grinding mills and reduced to a powder so fine that 92 parts or more will pass through a sieve having 100 meshes to the linear inch. This paper has to do only with the combustion process which takes place in the kiln. In the early days of the art fixed kilns were employed, but at the present time the rotary kiln is almost universally used.

The Rotary Kiln

The rotary kiln in its essential features was patented by Siemens in 1869 and, in combination with a gas burner and other appliances, by Ransome in 1885. It was not found successful in England for cement burning, but was adopted by the Atlas Company in America about 1890 and was improved and developed by that company and other American companies to such a degree that it practically replaced every other method of burning Portland cement.

The modern rotary cement kiln consists of a slightly inclined steel cylinder mounted on rollers and arranged so that it can be revolved. The upper end is connected to a stack or chimney for the escape of the discharge gases and is provided with means for supplying the raw cement material in the form of dust or slurry. At the lower end of the cylinder is a stationary hood which performs the function of affording a discharge opening for the burned material and which also acts as a support for the fuel supplying devices. The rotary cylinders are of various dimensions. The tendency has been continually to increase the size of the cylinder. Thus, for instance, in 1890 the rotary kiln were in some instances 4 ft. in external diameter and 40 ft. in length. From 1895 to 1902 the kiln dimensions were quite generally 6 ft. in diameter and 60 ft. long. At the present time kilns 10 ft. in diameter and 150 to 200 ft. long are common. The Atlas plant at Hudson is equipped with kilns 12 ft. in diameter and 232 ft. long. In most of the late installations the kilns

are true cylinders having the same diameter at top and bottom, but in many plants kilns are to be found with the diameter at the top about one foot less than at the bottom, the two parts being connected by a tapered section.

The rotary kiln is lined throughout with a fire-brick lining, except in rare cases where a very wet slurry is employed, in which case the lining for a short distance from the upper end is omitted. The temperatures required in the combustion chamber for burning cement clinkers are from 2800 to 3000 deg. Fahr. To withstand the high temperature, a lining having high refractory qualities must be employed. It must also have the quality of withstanding decomposition by the chemical action taking place in the kiln. The problem of kiln linings is a very serious one since no lining has been found that will stand for a great length of time under the conditions of operation. The lower part especially has to be repaired frequently unless the conditions are unusually favorable. The kiln is operated so as to keep the lining coated with the cement mixture for the purpose of protection. The lining problem, except as it bears on the combustion of powdered fuel, has no place in this paper and will not be discussed further.

During the early years of the Portland cement industry in this country, oil was employed as a fuel. This was sprayed into the lower end of the furnace with a jet of compressed air or steam. The oil was employed successfully, but due to the increasing cost after 1895 its use was very expensive. From 1897 to 1900, the increase in price was such as to make the use of oil nearly prohibitive from a commercial standpoint, and was the principal incentive for developing the use of pulverized coal.

In 1894, a series of experiments relating to the use of pulverized coal were started by the Atlas Company, in charge of Messrs. Hurry & Seaman, chief engineer and superintendant respectively. These experiments led to many discoveries, the invention of various parts, and finally to the commercial development of the art. Hurry & Seaman are entitled to the credit of the first successful use of powdered coal in the cement industry. This use was begun in 1895 by the Atlas Company and has never been discontinued. Other engineers along independent lines worked out the problem a few years later although possibly receiving some assistance from information disseminated throughout the industry relating to the results obtained by Hurry & Seaman. It may be stated that at the particular date referred to, every mill in the industry jealously guarded every detail of manufacture as a valuable trade secret, consequently little or no direct information as to details of process or machinery employed was common in the different mills. The information which leaked out at that time respecting details of operation or machinery was generally inaccurate and based on speculation or rumors. The success of the process of burning pulverized coal in the Atlas plant was not generally known in other mills until about 1900 when the process was put in successful operation in various plants by independent investigators.

The art as at present developed consists of a process for delivering to the kiln the powdered fuel or fuel dust by a jet of air which impinges on the fuel dust in some type of injector with force enough to discharge the dust into the kiln.

The injector varies greatly in different constructions but it performs the function of injecting the coal dust into the kiln by a jet of air and it does not handle sufficient air for combustion. The additional air needed for combustion enters the kiln principally through openings in the hood and through the discharge duct for clinker. The amount of air supplied by the compressors or fans should be sufficient merely to carry the dust into the kiln without producing an explosive mixture. The fuel dust enters the combustion chamber of the kiln in the form of a black cloud and burns in the form of an elongated torch. The length of the flame in actual kiln constructions is generally from 25 to 40 ft., although this is affected by conditions. The diameter of the flame in some places may very nearly equal that of the combustion chamber. Under best conditions of burning the flame does not perceptibly impinge against the sides of walls of the kiln, and the heat utilized is practically all given off by radiation.

The problem is one of combustion under peculiar conditions. The burning of pulverized coal differs from the burning of solid fuel, from a theoretical standpoint, principally in one particular. In the combustion of coal of commercial sizes lying on the grate, the air for combustion passes between the pieces of coal and the products of combustion pass off in the flues. Coal dust does not burn under such conditions, as the particles are so fine that sufficient air for combustion does not reach the coal through the crevices between the particles. To burn powdered coal successfully, it must be burned while in suspension in the air. In such a position each particle is surrounded by air which supports the combustion. The form of the furnace used in the Portland cement art is favorable for combustion in suspension since it is very long and affords plenty of room for such combustion.

Contact of the particles of coal dust with other bodies results generally in the lowering of temperature to such an extent as to make combustion impossible. The result is the virtual loss of any fuel which falls down onto the lining or onto the clinker. The time of combustion is evidently increased as the size of the dust particle is increased, from which it follows that the finer the grinding, everything else being equal, the quicker and more perfect the combustion.

In the early days of the development of the process of coal burning, ignorance of the necessity of fine grinding was the cause of many failures in burning coal dust. In the cement industry special devices for regulating the supply of air for injecting the fuel are supplied, but no special controlling apparatus is supplied for the air which enters the kiln through the various openings around the hood. It would be difficult indeed to control the admission of such air. By increasing the fuel charge, it is possible to bring the air supply down to nearly theoretical, or to any relative proportion desired. I have found from tests in the cement art that the best results are obtained when there is a slight deficiency rather than an excess of air. This is denoted by a short carbon monoxide flame at the base of the stack and also by analysis of the escaping gases.

Patents taken out many years ago for the burning of powdered coal under boilers and in various arts show various kinds of pulverizers and feeding devices, and also the idea of delivering powdered coal into the furnace by a jet of air or steam. Crampton suggested a pulverized coal flame for use in his type of rotary Portland cement furnace. No one, however, previous to Hurry & Seaman, seems to have comprehended the necessary underlying principle for successfully burning pulverized coal which requires the burning of the

coal while in suspension and the utilization of the radiant heat of combustion without substantial impingement of the flame. The failure to recognize such requirements is, in my opinion, in a large measure responsible for the practical failure of the burning of pulverized fuel in boiler furnaces, although such furnaces, because of form and proportion, make difficult the problem of burning coal dust in suspension. In practically all of the devices which have been tried under boilers the coal dust has impinged on bridge wall or sides of the furnace or on portions of the boiler before the combustion could be completed, resulting in waste, lack of capacity, and destruction of fire-box and fire-brick linings and other portions on which the flame impinged.

The fuel available for burning in Portland cement kilns can have a wide range of quality. The best bituminous coals are preferable, but those of quite poor quality are in successful use. I have known of the successful use of anthracite coal but it is difficult to pulverize and needs a high temperature for combustion.

The fuel used in the eastern portions of the country is generally obtained in the bituminous mines of Pennsylvania, Maryland, Virginia or West Virginia. The coal employed in mills in the western part of the country is frequently that most convenient to the plant and the cheapest in price on the heat unit basis.

Before the coal can be ground it is necessary that it be dried so that the moisture content will be less than 1 per cent, as the water in coal seriously affects the operation of pulverizing. It also has a detrimental effect on feeding and on the capacity of the kiln. The effect of the moisture, however, depends upon the kind of coal, so that no limit can be definitely stated as essential to success in advance of a trial.

The weight of pulverized coal required per barrel varies somewhat with the character of the kiln and the character of the process. In the dry process of manufacture the weight of fuel per barrel varies from about 22 to 26 per cent of the weight of cement produced, i. e., from 83 to 100 lb. of coal per bbl. In the wet process the coal varies from about 35 to 50 per cent of the finished product, i. e., from 133 to 190 lb. of coal per bbl. The theoretical amount of coal required, neglecting the heat due to the formation of silicates of lime and alumina, is probably not far from 30 lb. per bbl., provided 10,000 B.t.u. per lb. of coal is utilized. The continuous stationary kilns are reported as consuming 12 to 16 per cent of fuel, or from 45 to 60 lb. per bbl. of cement.

The capacity, in barrels per 24 hours, of the modern kiln when operating on dry material with flue gases about 1000 deg. Fahr., can be approximately expressed by the following formula

$$C = 0.1D^2L$$

where

C = capacity in 24 hours in bbl. of 380 lb.

D = outside diameter in ft.

L = length in ft.

The economy of the kiln has been increased by increasing its length, probably due in part to a change in the process of burning whereby the CO_2 is driven off from the material before it reaches the combustion zone in the kiln, and in part to a reduction in losses. The saving due to the use of the 150-ft. kiln in place of the 60-ft. kiln has exceeded 20 per cent in fuel and in addition has cut down the labor required in operation more than one-half. Kilns can be operated with a stack temperature less than 1000 deg. Fahr., but in that event the capacity

is lessened and the result is generally an increase rather than a decrease in cost.

Richard K. Meade, in his book on Portland cement, makes the following theoretical calculations as to the heat necessary per 100 lb. of raw material:

Heat required—	B.t.u.
Decomposition of 75 lb. $\text{CaCO}_3 = 75 \times 784 =$	58,800
Decomposition of 4 lb. $\text{MgCO}_3 = 4 \times 384 =$	1,536
	60,336
Heat supplied—	
Burning of 0.3 lb. sulphur $= 0.3 \times 4,050 =$	1,215
Burning of 0.8 lb. carbon $= 0.8 \times 14,540 =$	11,632
	12,847

Balance to be supplied by fuel..... 47,489
About 600 lb. of raw material are needed per bbl., so that the total heat per barrel required would be 284,934 B.t.u., neglecting the effect of the silicates. The combination of the silicates and lime gives off heat. This amount is in doubt as the exact resulting composition of the silicates is not known. A certain combination might produce 44,700 B.t.u. per 100 lb. of raw material, which is hardly possible, as it would reduce the theoretical heat to be supplied to 2789 B.t.u. per 100 lb. raw material, or to 16,734 B.t.u. per bbl. of cement.

The principal cause of lack of economy in the rotary kiln appears to be due to excessive flue loss. Dr. Joseph W. Richards has reported the following distribution of heat losses in a 6x60 kiln:

- 36 per cent excess air in chimney gases.
- 36.1 per cent necessary products of combustion.
- 10.7 per cent in hot clinker.
- 12.8 per cent in radiation and convection.

The above investigation indicates about 72 per cent flue loss of which about one-half is due to poor operation and is preventable.

In order to utilize the waste heat in the stack, I arranged in the Cayuga Lake plant to pass the discharge gases of two kilns through a boiler and an economizer, the draft being maintained by a fan. I also arranged to heat the air entering the kilns by drawing it through the hot clinker discharged from the kilns. The kilns were 60 feet in length and 7.5 feet in diameter at the lower and 6.5 feet at the upper end. A very complete test was made by J. W. Prince, M. E., under my general directions, of which the results are shown in Table 1.

From these data Table 2 has been computed showing the approximate distribution of heat throughout the process.

This investigation showed that about 50 per cent of the heat was discharged into the stack and of that amount about 68 per cent could be utilized in a boiler and economizer so that the ultimate flue loss was reduced to about 17 per cent of the fuel.

In the cement industry very few attempts have been made to utilize the heat of the escaping gases. So far as I know, the only successful installation of that kind is that in the plant at Kosmosdale, Kentucky. The reason why the waste heat has not been utilized to a greater extent is no doubt due to the difficulties of arranging and maintaining the waste heat boilers in good condition. I am satisfied, however, that such difficulties are not so serious as to prevent a good return on the investment. It is doubtful if the difficulties are more serious than have been overcome in the steel industry.

Since 1902 the present methods of burning Portland cement have been in successful use, and without further reference to prior methods I will give a brief description of the machines employed, without going into minute details, so that they can be made a permanent part of the records of the society. The operations required for burning pulverized coal consist in (a) drying, (b) pulverizing, (c) conveying, (d) storage, and (e)

feeding. All these operations are provided with special machines and will be discussed later in the paper.

Drying

Previous to drying, the coal is crushed by passing through rolls plain or toothed, or through crushers, to break up the large pieces. For the purpose of drying, rotary cylinders are generally employed, provided with an external furnace. The rotary cylinder of the dryer is frequently subdivided by partitions, or else provided with Z-bars, which raise the coal upward as the cylinder revolves and bring it into better contact with the heat and gases.

In some of the coal dryers, which is a dryer constructed by the Vulcan Iron Works, the discharge gases from the external furnace are arranged to pass through the dryer.

The dried coal is usually discharged into suitable conveyors and immediately removed to bins over the pulverizing machines. This adds to the efficiency and capacity of the dryer but also increases somewhat the danger of conflagration while in the dryer. This danger is slight; however, in practice and with good construction it is quite certain not to result in serious damage, and can always be obviated by care so that the practice is not open to serious criticism.

The coal dryer is frequently provided with a stack to remove the dust. The size of the dryer is usually selected with reference to the maximum amount of moisture to be removed. Large plants usually have from two to three dryers, of sizes varying from 4 by 40 feet to 6 by 60 feet.

Various other types of dryers of special design and considerable merit are employed in some plants but they can hardly be considered in a paper of this general character.

The waste heat of the plant is available for use in dryers, but the amount of heat needed for the coal drying is so small as to make the installation of the waste heat equipment usually a poor investment. This statement may not apply to other dryers of the plant requiring a greater expenditure of heat.

The Pulverizing Machinery

The coal, if delivered in large lumps, is broken into small pieces by passing through plain or corrugated rolls or crushers, before entering the dryer. This machinery will not be described here as it is commonly used for such purposes in all arts.

The pulverized coal must finally have a fineness so that not less than 92 per cent will pass a sieve of 100 meshes to the lineal inch, in order to pass the usual standard requirements. It is desirable to have the coal still finer. The pulverizing machinery employed is adapted to two systems of dust burning. In the first system the pulverizer is arranged so as to deliver its product directly into the kiln without intermediate storage, and has a capacity of supplying one kiln. In the second system the pulverizers have large capacity and are arranged so that the pulverized coal is stored for a short time before being fed into the kiln. The first type of pulverizer is used only to a small extent at the present time. The second type is used almost exclusively in the various cement kilns.

The Aero Pulverizer, which is of the first type, is employed in certain mills of the Universal Portland Cement Company, and consists essentially of a horizontal shaft revolving at high speed which carries beaters or revolving arms throughout a greater portion of its length and fan blades near the discharge end. When it has been sufficiently pulverized to be handled by the blast produced by the fans, it is delivered through an inlet pipe which leads directly to the kiln. The capacity is controlled by suitable dampers in the supply pipe. I am

informed by the president of the Universal Portland Cement Company, Mr. Hagar, that his recently constructed mill is equipped with coal pulverizing apparatus with intermediate storage between the mill and the kiln.

The pulverizing machines mostly used in the Portland cement industry for the purpose of pulverizing coal are the Griffin mill, the tube mill and the Fuller-Lehigh mill. These are all fine grinding mills and are not adapted to receive large pieces of coal.

In the Griffin mill grinding is performed by a roll attached to the end of a vertical shaft, which is suspended by gimbal joints from a horizontal driving pulley. The grinding roll comes in contact with the interior surface of a ring of hard steel by which means the grinding is accomplished. The grinding roll, however, has a swinging gyratory motion and is not uniformly in contact against the ring. The pulverizing is therefore accomplished partly by the force of impact and partly by a rubbing motion.

The bottom of the grinding roll carries projections which continually throw the coarse particles to be ground from the bottom of the mill up against the internal surface of the ring, where it is pulverized. The ground material is then thrown upward and outward by fan blades attached to the shaft which supports the grinding roll, causing the material to impinge against a screen which allows the fine particles to pass through, but preventing the escape of the coarser particles.

The Griffin mill is a very effective grinding machine and is economical in the use of power. It is objectionable principally because of the dust which it produces. It has a capacity of pulverizing to a fineness of over 90 per cent through a sieve with 100 meshes to the lineal inch, as follows, for the two sizes of mill which have been made:

30-in. mill, 2 tons per hour.....	35 h.p.
40 in. mill, 4 tons per hour.....	65 h.p.

The 30-in. Griffin mill is in extensive use but is no longer manufactured.

The tube mill is extensively used for grinding coal, also for grinding rock and finished material in cement mills, and is constructed by several manufacturers. It consists essentially of a large cylinder mounted on hollow trunnions at the ends. The cylinders vary in diameter from 4 to 6 feet, and have a length varying from 22 to 30 feet. The material to be pulverized is fed through a hollow trunnion at one end and is discharged at the opposite end. The cylinder is filled about 40 per cent full with hard silicious pebbles usually somewhat elliptical in form and having diameters not greatly different from 2 inches. The mill is lined with some tough materials which can be readily replaced, such as silica blocks or plates of steel. The rotation of the cylinder lifts the load of pebbles and material being pulverized and causes the pebbles to roll and slide over the material to be ground as it passes through the mill. The result is an extremely fine product. The 50-inch tube mill 22 feet in length has a capacity of about four tons of coal per hour and requires about 75 horsepower. The tube mill is practically dustless and is noiseless. But it requires very dry coal to be successful.

The Fuller mill is probably the most extensively used of any grinding mill for coal in the Portland cement industry in this country. This mill is a comparatively new one and is manufactured by the Lehigh Car Wheel & Axle Works, at Fullerton, Pa. In this mill the pulverizing element consists of four steel balls which roll in a stationary horizontal concave-shaped grinding ring. The four balls are propelled around the inside of the grinding ring by means of four pushers. Directly above the pulverizing zone is a separating chamber which is completely encircled by a screen of woven wire cloth. The material is thrown against the screen by a fan keyed

direct to the main shaft and revolving with it. Outside of the screen and separated from it by several inches of space is an outside casing through which all the finished material passes. There is also an exhaust fan beneath the pulverizing zone which induces a discharge through the screen and also tends to facilitate the discharge of the ground material. The material to be pulverized is fed from a hopper at the top of the mill by special feeding mechanism to the pulverizing zone. The mill is driven by means of a pulley or gears attached to the main shaft below the pulverizing zone.

The Fuller mill is constructed in two sizes, 33 in. and 42 in. The capacity of the 33-in. mill is given as 2 to 2.5 tons per hour for an expenditure of from 30 to 35 h.p., and of the 42-in. mill as 4 to 6 tons per hour with an expenditure of 45 to 50 h.p.

In addition to the pulverizing mill described in this paper, other mills are employed to a limited extent. The Atlas Portland Cement Company employ Huntington mills for coal grinding which they manufacture in their own shops. The Huntington mill is in structure much like the Griffin mill but it is provided with three pulverizing rolls instead of one.

Conveying Machinery

I shall make no attempt to describe the conveying machinery employed in modern cement mills for conveying the coal to the various parts of the mill. This machinery differs greatly in the different mills. In the great majority of mills screw conveyors are employed for moving the coal horizontally and bucket and chain elevators encased in dust-proof housings of steel for moving it vertically. In other mills belt conveyors and pan conveyors are used.

The requisite for safe conveying is the prevention of an explosive mixture of pulverized coal and air. Neglect of this precaution has caused the loss of many lives and the destruction of a great deal of property in the Portland cement industry. The present practice endeavors to keep the pulverized coal from mixing with air so that if it should happen to catch fire it would burn slowly without producing disastrous explosions.

Storage of Pulverized Coal

Storage capacity for pulverized coal, because of the element of danger, should be as small as possible consistent with the continuous operation of the mill. It is customary to provide for each kiln a storage bin with a capacity of from 6 to 10 hours of operation. Such bins are usually located 15 to 20 ft. from the lower end of the kilns where they do not interfere with the operation. Each bin is supplied by a conveyor leading from the pulverizing machine.

Feeding the Coal

Powdered coal is fed from the bottom of the bin by adjustable feeding arrangements generally consisting of a double-threaded screw conveyor having a variable feed. The coal dust is blown into the kiln by a jet of air with some type of injector. In some of the plants compressed air of from 30 to 40-lb. pressure is employed for delivering the pulverized coal; in other plants air is obtained from a rotary fan at about 2 ounces pressure.

The coal feeding injectors are located in front of the stationary hood and arranged to deliver the jet of coal dust axially to the kiln. Practice has proved that it is unnecessary to use more than one jet to a kiln, although in some of the constructions two jets are used. The detailed construction of injectors for feeding the pulverized fuel differ in the various plants.

I present a set of drawings which show a complete installation of coal pulverizing machinery having a capacity of about 8 tons per hour. (See Oct. issue, 1914, the Journal of the American Society of Mechan-

ical Engineers, New York.) These drawings I have selected as illustrating simply and completely the machinery needed for a coal pulverizing equipment. They were prepared by the Lehigh Car Wheel & Axle Works and are submitted by permission. They appear as Figs. 8 to 11 in connection with this article. Fig. 8 is a plan view showing the arrangement of the machinery. Figs. 9, 10 and 11 are vertical sections which show the locations in a vertical plane of various machines. By reference to these drawings it will be noted that machinery is provided for crushing the coal in crushing rolls, elevating the crushed coal in a dust-proof elevator A, to the top of the mill where it discharges by gravity through a coal scale and then into the upper end of a rotary dryer. The coal passes through the dryer which removes the moisture, then it is discharged into a dust-proof elevator B, and raised to a height sufficient to fall by gravity into the storage bin for dried coal located at a higher level than the pulverizing mills. From these storage bins the coal is drawn by gravity into the pulverizing mills. The pulverized coal is then raised by a dust-proof elevator C, to a point where it is discharged into a screw conveyor D, leading to the storage bins near the kilns. The drawings show the various machines as driven by electric motors, which is customary in the art. The rotary dryer is of the general type of one already described in this article and has a rotary cylinder 4 ft. 6 in. in diameter by 32 ft. in length.

The paper is intended to give an idea of the difficulties overcome and the results attained in the burning of pulverized coal in the cement industry without referring to many details of construction. The process of burning in the cement kiln is described quite at length in order that the reader may understand the peculiar character of the problem involved in the cement industry and the differences of the combustion processes in that art and in the steam boiler furnace. It is hoped that a full discussion will give additional information on this subject which will tend to improve the efficiency of combustion in all arts.

TABLE 1 DATA TWO KILNS, EACH $7\frac{1}{2}$ and $6\frac{1}{2} \times 60$

Coal consumed per hour, lb.....	1888
Clinker specific heat.....	0.2
Clinker produced per hour ($\text{CaO}=62$ per cent), lb....	8018
Weight CaCO_3 per hour, computed, lb.....	8875
Moisture in raw material, per cent.....	3.1
Weight CO_2 per hour from material, lb.....	3660
Weight of air supplied per lb. of coal, 44 per cent excess, lb.	16.1
Total weight of air supplied per hour, lb.....	32397
Weight of air supplied by coal feeders per hour, lb....	5850
Total weight of gases discharged per hour, lb.....	37749
Heat discharged per lb. of gas, 0.23 (1800—100), B.t.u..	391
Area of outside of kiln, sq. ft.....	1213
Area of hood exposed, sq. ft.....	76
Air entering kilns, deg. fahr.....	480
Air leaving kilns, deg. fahr.....	1820
Air leaving boiler, deg. fahr.....	660
Air leaving economizer, deg. fahr.....	450
Temp. of kiln by optical pyrometer, lower third, deg. fahr.	2350 to 2960
Temp. of kiln by optical pyrometer, upper part, deg. fahr.	2960 to 1800

TABLE 2 APPROXIMATE DISTRIBUTION OF HEAT
B.t.u. Per cent

Heat entering kilns from clinker cooler...	2,041,000	
Heat entering kilns from comb. of coal...	26,450,000	
Heat produced from chemical reactions...	632,206	
Total heat supplied.....	29,123,206	100
Discharged from kiln to boiler.....	14,859,859	51.2
Discharged with clinker ($8018 \times 2 \times 500$)...	4,409,540	15.1
CaCO_3 decomposed (8875 lb. at 765).....	6,789,375	23.3
126 lb. sulphuric anhydride liberated.....	238,140	0.8
252 lb. water evaporated	303,200	1.0
Radiation and unaccounted for.....	2,523,092	8.6
Radiation per sq. ft. of surface of kiln per hour	974	
Heat absorbed by boiler from kiln gases.	8,798,328	30.5
Heat absorbed by economizer from kiln gases	1,178,998	4.0
Stack loss and boiler radiation.....	4,882,533	16.7

RECENT SHIPMENTS OF BRADLEY HERCULES MILLS

The Bradley Pulverizer Company of Boston announce that they have just shipped another Bradley Hercules Mill to the Riverside Portland Cement Co., Riverside, Cal., making this the third order received from these people in eighteen months. "We have also today received an order from the Superior Portland Cement Co. of Seattle, Washington for an installation of this mill which is an indication that it is the most economical and satisfactory preliminary pulverizer ever used by the cement manufacturers. It is the largest single pulverizing unit ever manufactured; operates at the minimum cost for maintenance and requires less horsepower per barrel than any other type of preliminary grinder."

"The Bradley Hercules Mill is certainly not an experiment, it has been used successfully pulverizing both limestone and clinker and has demonstrated to be satisfactory for use when grinding these materials. We will be very pleased to send literature and full data on this mill to prospective users and will be glad to furnish a complete list of installations to investigators."

"We would also like to mention the fact that we are supplying our 42" Bradley Three Roll Mill to many users for the purpose of pulverizing limestone for agricultural purposes. We have recently shipped two of these machines to the Pownal Lime Co., North Pownal, Vt. This mill has demonstrated that it is in a class by itself as a pulverizer of limestone for agricultural purposes as it gives the proper fineness using the minimum amount of power and operating at a very low cost of maintenance."

"The Giant Griffin Mill still retains its lead as being the most efficient single stage pulverizer used by the cement manufacturers. It is increasing in popularity every year and is operating at a lower cost for maintenance and power than that of any other single stage pulverizer in existence. There are now over one hundred and fifty (150) of these mills in operation and every one is giving complete satisfaction. For the small cement plant we believe this to be the ideal pulverizer. We are always glad to supply a list of customers so that prospective users can obtain direct from present operators their opinion of this mill."

"With the Bradley Hercules, Giant Griffin Mill, and 42" Bradley Three Roll Mill we are in a position to furnish pulverizing machinery for any material that is of a dry nature requiring fine pulverizing."

PRODUCTION OF PORTLAND CEMENT IN 1914

The Portland cement manufactured in the United States in 1914 approximated 88,514,000 barrels, compared with 92,097,131 barrels in 1913, a decrease of about 3,583,000 barrels, or nearly 4 per cent. These preliminary figures are given out by the United States Geological Survey and are based on returns received by E. F. Burchard from all the operating mills in the United States except one, for which an estimate has been made. The estimated shipments of Portland cement during 1914 were 86,715,000 barrels, compared with 88,689,377 barrels in 1913, a decrease of about 1,975,000 barrels, or 2.2 per cent. On account of the surplus of production over shipments stock of cement at the mills apparently increased more than 14 per cent, or from 11,220,328 barrels in 1913 to 12,818,000 barrels at the close of 1914. The estimates furnished by some producers undoubtedly included more or less unground clinker, but it is believed that the figures for production and shipments, if not for stocks, are close to those that will be shown later by exact reports from the producers.

The Lehigh district of eastern Pennsylvania and western New Jersey produces more cement than any other section of the United States—about 28 per cent of the total production. This district showed a decrease of more than 9 per cent in both production and shipments of Portland cement. The Illinois and northwestern Indiana district, which is next in importance, with an annual output of more than 11,000,000 barrels, showed a slight decrease, and the Pacific coast district (California and Washington), which is third in importance and produces about 8,000,000 barrels, showed a decrease of about 12 per cent. Important increases in production and shipments were shown by New York State, the Michigan-northwestern Indiana district, the Iowa-Missouri district, the Maryland-Vir-

suffered from the effects of cement dust that has escaped from the plant of the company.

U. S. STANDARD BLOCK MACHINES

The U. S. Standard block machine illustrated herewith is entirely different from any others. One reason why they are different is because the system of coring permits the use of very wet material which produces a much stronger block; the other, they are two machines in one. First, a machine to make outside or hollow blocks; second, a machine to make veneer and partition blocks. The change is made in a moment. For speed they cannot be surpassed. The U. S. Standard Block Machines are made in two sizes. The Junior or 16-inch machine and the Senior or 24-inch machine.



N. S. Standard Block Machine.

ginia-West Virginia district, and the Rocky Mountain district. The average value per barrel was probably slightly lower than in 1913.

1915 AMERICAN CEMENT DIRECTORY

The Bradley Pulverizer Company, Boston, Mass., announce that they have contracted for the 1915 edition of the American Cement Directory and intend distributing this little Cement Directory free of charge to parties in the cement industry who would be interested in receiving a copy. This little Directory has now gone to press and they expect to receive first copies within thirty days at which time they will start distribution of same.

CEMENT COMPANY SUED

Five suits for damages aggregating \$64,700 have been filed in the Superior Court against the Riverside Portland Cement Company, Riverside, Cal., by residents of West Riverside, who claim their property has

The Junior is a one-man machine, the Senior a two men. The variety and style of blocks are unlimited. For one that is in the market for a wide range it will pay to investigate.

Test and try this machine before you buy. It is your privilege to test the U. S. Standard Block Machine before you buy. It is giving excellent satisfaction to users; why not have it work for you? "All we ask is a chance to have you try our block machine," says Mr. C. H. Snyder, the president of the U. S. Standard Manufacturing Company, 325 Virginia avenue, Ashland, Ohio. "We will operate it to your satisfaction or no sale." Send for catalog "A."

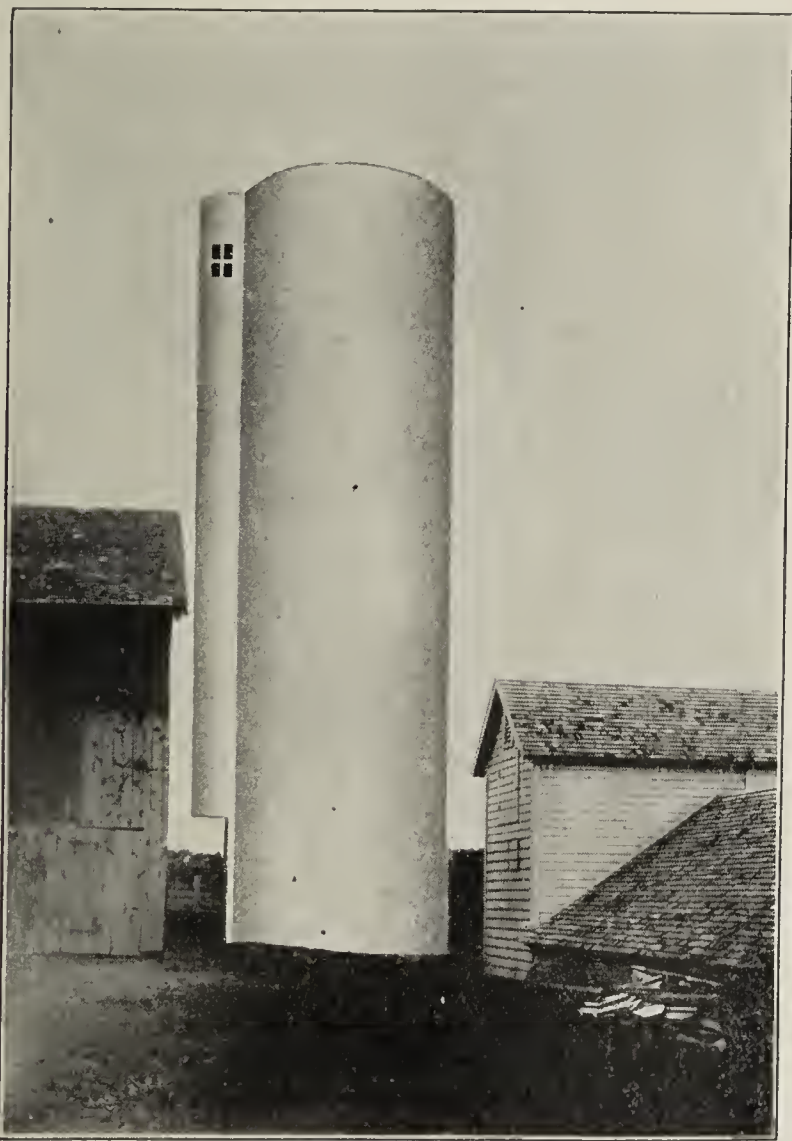
A CORRECTION

Referring to the write-up in our December number concerning the quarry and crushing plant of the Columbia Quarry Company we beg to advise this article was taken from *The Excavating Engineer*, published in Milwaukee, Wis.

CONKLIN SILO FORMS

The Conklin Construction Company, 430 Main street, Hartford, Mich., will not have an exhibit at the Cement Show, as they cannot get space on account of being too late in sending in their application. They inform us, however, they will have rooms at the Fort Dearborn Hotel during the show, where they will have a model of their equipment and samples of different parts. They will be glad to receive interested parties. Referring to their silo forms, they state:

"We are manufacturers of the CONKLIN MONOLITHIC EQUIPMENT, which is very desirable for silo construction and may be used for many other purposes in concrete work. Our new catalog explains in detail the many advantages of the CONKLIN EQUIPMENT. We want to direct your attention to a few very important points that will bear repeating, and should have your very careful attention at this time.



Concrete Silo 14 Feet by 54 Feet on the S. A. Drake Farm.
Sutton & Moore, Contractors, Canton, Ill. Conklin Forms Used.

First, our equipment is built very strong, which is a great advantage to the contractor. It carries its own scaffolding, is automatically raised by the two jacks on the center mast. The silo may be built any height or diameter by using the proper size moulds, and will not vary from a true circle, even thickness of wall or a true perpendicular.

Second, you may build 8 feet per day with four men, or 64 feet of silo wall in 8 days. You will admit that this is rapid work, and will add to your profit.

Third, an important feature has to do with water tank construction on top of the silo, which can be done with the CONKLIN SILO EQUIPMENT. You will admit that farmers need a water supply. Water in the barn, for live stock and poultry, in the house that the modern conveniences may there be enjoyed, as a fire protection, not only a comfort and satisfaction, but enables you to reduce the insurance rate.

Fourth, we furnish an experienced man three days. He will show you how to set up the machine and teach you to build a MONOLITHIC SILO. By having this expert teach you, your job will be right. All jobs thereafter will be equally well done. We also furnish you 50 catalogs, 500 business cards, 100 contract blanks, 2 electrotypes of finished silos and a leather covered book of photographs of silos mounted on cloth. You are then ready to take orders for next year's jobs. This will cost you \$15. When you purchase a CONKLIN SILO EQUIPMENT the \$15 will be allowed you.

Fifth, order now the CONKLIN SILO EQUIPMENT. Have it set up on your premises—show every prospective silo buyer the many advantages of having the silo constructed under our system. Money cannot buy a better silo. There is money in it for you.

Sixth, do not let the other silo men get ahead of you. Order the \$15 outfit—start your advertising and get business. A special discount of 10% on the amount for a SILO EQUIPMENT. Order must be received this month.

LUNKENHEIMER VALVES

Valves of exceptional durability are necessary for such purposes as throttles for injectors and steam pumps, blow-offs for water columns, drains for main headers, etc., in all of which cases the valve is never fully opened and the seating surfaces are subjected to the tremendous wear caused by wire-drawing. The "Ferrenowo," due to the presence of the "Lunkenheimer Seat-guard," is particularly adapted for such cases.

The strength of the valve is by far greater than that required in actual service, and the design is as near perfect as modern science can conceive.

All iron "clip" gate valves are used extensively in mines, oil refineries, tanneries, pulp and chemical fiber mills, soap and white lead works, canning and packing establishments, and a number of other places where cyanides, creosote and alkaline solutions are handled.

The entire success of this valve, as in the case of all other Lunkenheimer specialties, is due to the "quality" of materials, uniformly maintained under the supervision of chemical and physical laboratories; workmanship uniform to gauge, and perfection of finished and assembled product, by means of individual tests and inspection before and after assembling.

DUSTLESS CONCRETE FLOORS

By spreading dry cement and sand over burlap laid on the wearing surface coat of concrete immediately after it is struck off, sufficient moisture is removed to produce a dustless floor, according to P. M. Bruner, who controls the process. Up to the time of applying the burlap, standard specifications are followed. The dry mixture similar to that used for the wearing course is spread lightly on the burlap and distributed with a wood rake to a depth of $\frac{1}{2}$ in. Capillary attraction abstracts the excess of water in from 20 to 30 min., as much as 25 or 30 per cent of the water from the underlying surface being taken up in this way. The mixture is then lifted by the burlap and dumped into the mixing box for the next batch. The surface of the floor is in perfect grade and ready for final finishing by wood float or trowel. At this period the whole body of the concrete topping is so stiff that no impression is made by walking over the surface or in working on the surface in the subsequent manipulations.

About three years ago Mr. Bruner concluded that the dusting of concrete floors was due to the fact that

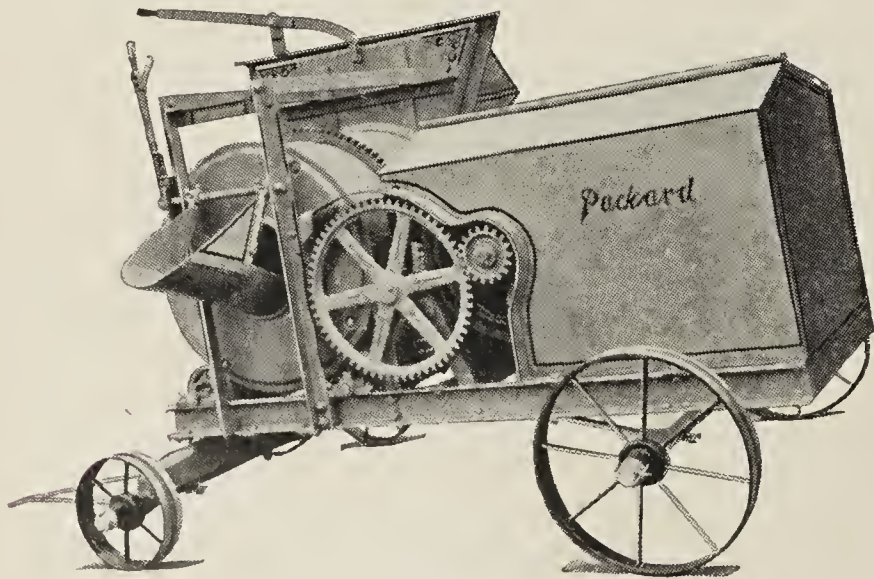
the setting of the cement is disturbed during the process of finishing. Owing to the excess of water necessary for the successful manipulation of the mortar used in the wearing course, considerable time usually elapses before the surface becomes stiff enough for troweling, since this surplus water must either evaporate or be taken up by the concrete base on which the top is placed. With a concrete sidewalk the wearing course is usually placed on an absorptive base which takes care of the excess water used in the mixing. In case the surface is applied directly to a reinforced-concrete floor which has previously hardened, there is no opportunity for disposition of this excess water. The same holds true when the top is placed on a rich, wet concrete similar to that used in reinforced work. The result is that in the interval which elapses while the excess water is disappearing the cement partly hardens and the late troweling has a tendency to break up the crystals formed. Further than this, any troweling has a tendency to bring up the excess water to the surface, forming a film of what is sometimes termed "drowned" cement. When wear takes place subsequently this surface film is the first to scale off, leaving a sandy finish which is subject to excessive abrasion, particularly on account of its own rough surface.

A number of floors of considerable area finished by this method have been in place for two or three years, and at present concrete floors in several buildings of the Chicago Telephone Company in and around Chicago are now being laid according to the above procedure by the P. M. Bruner Granitoid Company, of St. Louis.

PACKARD MIXERS

The catalog that the Contractors Machinery Co., 130 Eleventh St., Keokuk, Iowa, are mailing out, show a very neat design, sturdy, compact, 5 cu. ft. capacity mixer at the surprising prices at from \$78.00 to \$185.00.

The Packard Mixers seem to be about the same design as the Popular and Successful paving mixers—and one of the interesting features is that the mixing action of this Packard mixer is the re-mix mixing action usually shown on larger mixers.



The Packard Mixer.

Their catalog ought to be of great interest to the man who has country work to do, as their mixer tracks in standard wagon tracks and only weighs from 700 lbs. to 1750.

Their catalog shows that the makers of the Packard mixers are wise in designing them with the low loading feature, in fact they claim to have the lowest loading mixer made—the wheelbarrow hopper is only 30" from the ground about kneehigh—that is low isn't it?

They also equip their mixers with a low loading hinged platform only 22" from ground. The measuring batch hopper which increased capacity about 25

batches a day by the same number of men is only 42" from ground.

You will notice in their catalog that the Packard mixers have plenty of power, having a 3 H. P. gasoline engine with a 4¼x6" cylinder. The engine is housed with a steel automobile housing.

The specifications shown in the Contractors Machinery Co.'s catalog shows steel construction in all their mixers which makes them well built, and very strong.

The combination hoist and mixer feature is a clever idea.

The catalog shows a hand mixer also, which is designed with the same mixing action and this mixer really is a fine thing as it gives a man the same mixer as the power mixers, only without power.

The fact is any man interested in mixers ought to get their catalog. We notice that the Contractors Machinery Company, 130 Eleventh St., Keokuk, Iowa, have a very liberal trial proposition and guarantee.

A VALUABLE BOOK ON THE CONCRETE BUSINESS

What must be considered as one of the most interesting and instructive books on the concrete business, especially from the standpoint of its profit possibilities, is the new catalog of the W. E. Dunn Manufacturing Company, 4139 Fillmore street, Chicago, a copy of which has recently reached us. While primarily intended to describe Dunn machinery and molds, its treatment has been extended so that the reader can get a fairly accurate idea of what profits he can expect to make with the various products which the equipment manufactures.

The book measures nearly 8x11 inches and has 72 pages. The cover is printed in three colors—brown, green and silver—on a buff stock and is appropriately designed as shown by a reproduction. The first eight pages are printed in brown ink on India tinted antique paper, and are devoted to outlining the firm's selling policy of giving fifteen days' trial on any machine or mold before purchase is consummated. Several of these pages show some instructive data concerning the wonderful possibilities in manufacturing cement drain tile, and show how cement is supplanting clay for tile in every section of the country. Tables of cost of manufacture and selling prices bear out the statement that this branch of the concrete products business is one that should not be overlooked.

The following 64 pages are printed in black on enameled book paper, and every page contains something of value to the progressive cement contractor. The description of the various machines and molds is very thorough, yet not technical, and the quality of the various illustrations brings out the equipment as it actually exists. It is pleasing to note that no attempt has been made to belittle the equipment made by other concerns, although it has been found necessary to make comparisons in certain places in order to give reasons for the distinctive design of Dunn machines. A cursory glance through these pages shows that on page 41 are given the cost of manufacturing concrete fence posts; on page 45, the cost of producing concrete sewer pipe and large tile; on page 53 we get the cost of making concrete blocks; on page 57, the cost of making cement brick; the last pages being given up to describing Dunn ornamental molds, porch molds, etc., together with the cost of manufacture and selling prices.

All told, the book is an excellent example of co-operation between the manufacturer, writer, artist and printer in producing a book that men in the concrete business will appreciate and keep. A copy will be sent to any man interested upon request.

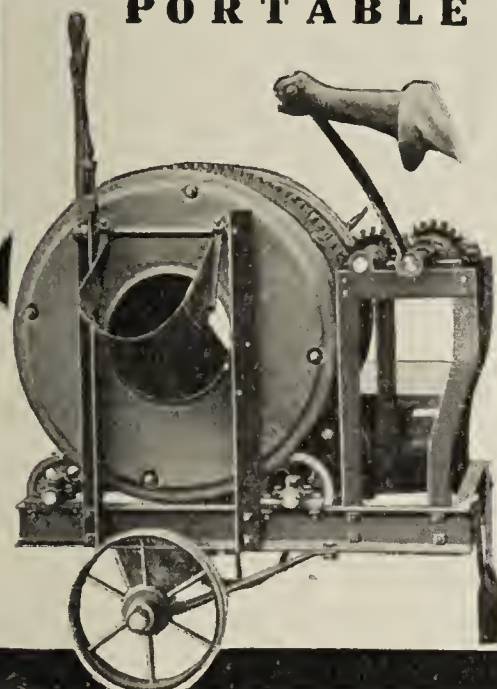
\$78⁵⁰

Lowest Charging Mixer Now Furnished With Steel Hinged Loading Platform

5 Ft.
Capacity

Also
Furnished With
Hoist
Power Loader
Batch Hopper
Measuring
Water Tank

Buys
A Real Hand Mixer
Capacity up to 4 1-2 Feet
Wick Oiling Boxes
PORTABLE



SPEED QUALITY
Packard
HAND AND POWER MIXER.

STURDY

**Portable Quality Mixer
At Wholesale Price**

Steel Construction, Semi-Steel Gears

CASH OR PAYMENTS

Fully Guaranteed—Money Back After Five Days' Trial

CONTRACTORS MACHINERY COMPANY
130 ELEVENTH ST., KEOKUK, IOWA

\$185

Mixer on steel trucks
3 H.P. Engine, Steel
Housing, Low Barrow
Hopper, Ready to Run

Test and Try Before You Buy

It Is Your Privilege to Test the U. S. STANDARD CONCRETE MIXER Before You Buy

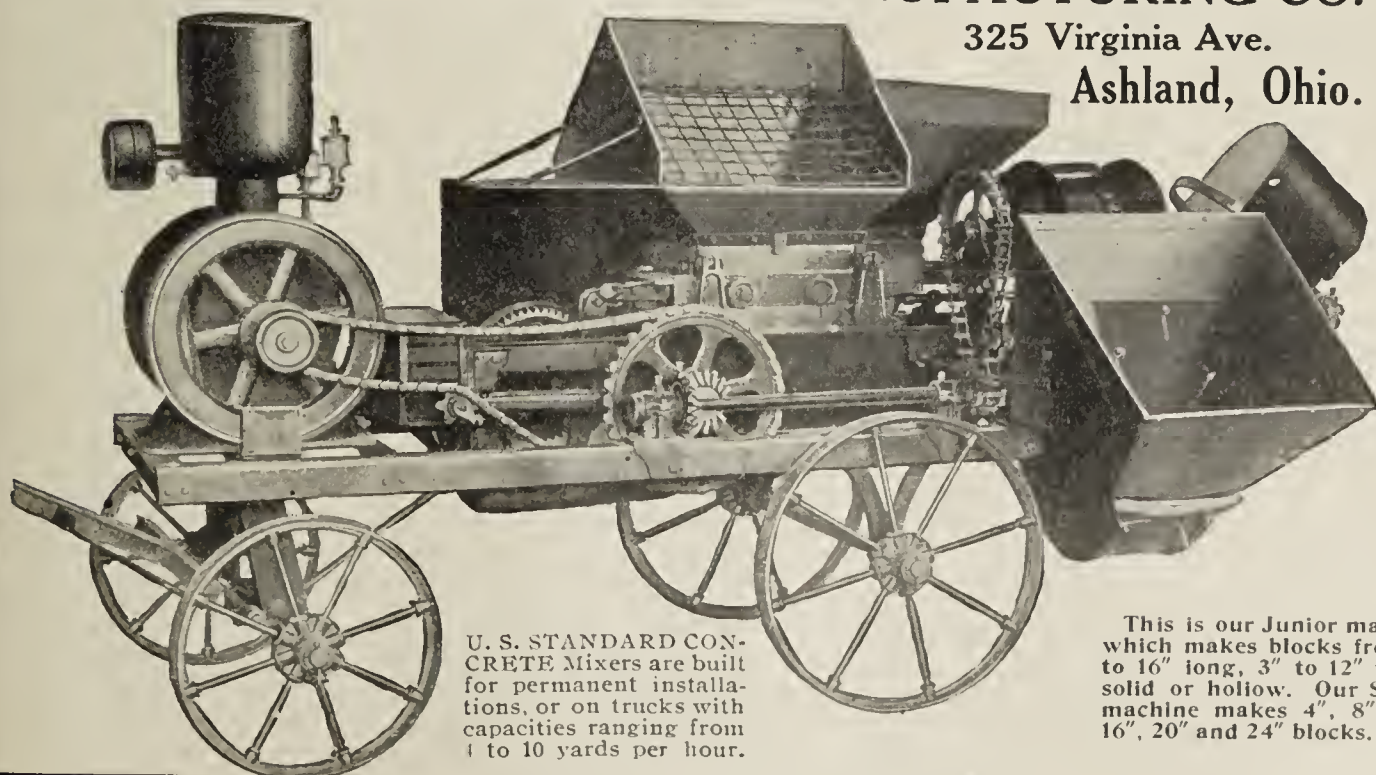
The U. S. STANDARD CONCRETE MIXER is a continuous mixer with a positive measuring, proportioning and feeding device which makes it more accurate than any batch mixer ever made, because it does not depend upon the brain of the operator. It will stand the hardest tests put to it. There are no weak parts in it to cause break-downs, or defective operating parts to cause delay. All parts are interchangeable; workmanship the best. Warranted to embody the most practical and up-to-date working principles. Simple operations change the adjustments to suit any worker. Is giving excellent satisfaction to users. All we ask is a chance to have you try our mixer. We will operate the mixer to your satisfaction on the job, or no sale.

WRITE FOR CATALOG
"A"

U. S. STANDARD MANUFACTURING CO.

325 Virginia Ave.

Ashland, Ohio.



U. S. STANDARD CON-
CRETE Mixers are built
for permanent installa-
tions, or on trucks with
capacities ranging from
1 to 10 yards per hour.

We also manufacture the famous U. S. STANDARD Block Machine. Turns out solid or veneer blocks, as well as hollow blocks with oval air spaces. It is built in two sizes, and is so designed that it handles wet mixture perfectly, resulting in a block of unusual density and strength. For speed they cannot be surpassed.



This is our Junior machine which makes blocks from 4" to 16" long, 3" to 12" thick, solid or hollow. Our Senior machine makes 4", 8", 12", 16", 20" and 24" blocks.

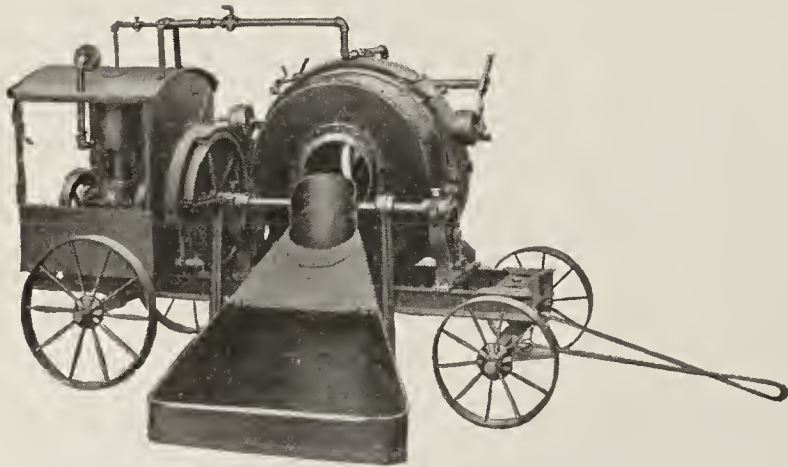
THE SMITH MIXERETTE

The Smith Mixerette is the latest addition to the nontilting line of Smith Mixers. It is the answer to a demand which has manifested itself during the past two years for a light, portable and inexpensive mixer of small capacity. The Mixerette, holding five cubic feet of dry sand, stone and cement, or three cubic feet of mixed concrete, will produce five cubic yards of mixed concrete per hour—just what is needed by contractors for small concrete jobs.

While the Smith Mixerette embodies Smith quality and retains the high standard of construction and design which were in evidence in the big Smith Mixers used on the Keokuk dam, at Arrowrock, on the sea wall and causeway at Galveston, on the Key West extension of the Florida East Coast Railway, on the New York aqueduct, and elsewhere, it likewise embodies new features which are bound to make it as famous as its big brothers.

Two features stand out very prominently. The main drum ring and driving pinion are entirely enclosed and protected from the finest particle of dirt or dust. The drum ring itself combines a large gear, encircling the drum, and two machined tracks. The dust-proof casing which covers the drum ring has two machined surfaces which fit snugly over the two machined tracks encircling the drum. This forms the bearing surface upon which the drum revolves. This sliding bearing eliminates main rollers and other supporting and driving mechanism. The lower portion of the casing coming down to the truck sills, forms a supporting pedestal for the drum.

The dust-proof casing is fitted with pressure grease cups so that the machined surfaces can be kept cool and clean at all times. This excludes the dust and doubles the life of the mixer itself. This new feature will appeal particularly to the many contractors who have continually had trouble with their main roller tracks developing flat spots and the main rollers themselves wearing out rapidly, thus causing a wobbly, uneven motion of the drum which will rapidly wear out the driving pinion and at the same time cause a great loss of power on the machine.



Smith Mixerette on Steel Truck with Gasoline Engine, Loader and Water Pipe Connection. Note Gear Driven to Loading Skip.

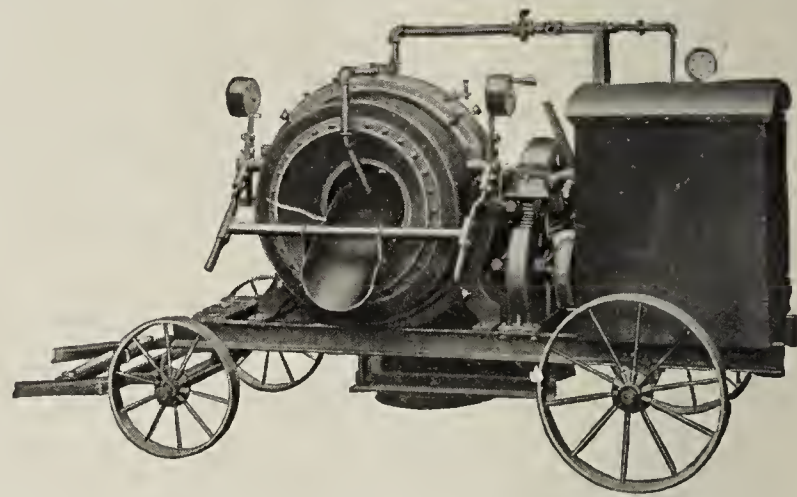
Another big feature of the mixerette is the famous "ropeless" loader, the skip being raised by means of gears. There are no cables to break and no sheaves to get out of order, consequently none of the jerking, twisting motion of the ordinary pivoted hopper, and no binding strain on the loader frame. It lifts easily and smoothly, being easily controlled by the jaw clutch and the brake. When the skip reaches its highest point, discharging into the drum, it strikes a projected finger which automatically disengages the hoisting clutch, thus preventing any straining or damage to the hoisting mechanism.

The Mixerette is operated by a high-priced, hopper cooled, gasoline engine, enclosed in a steel house, and thus fully protected against any damage.

The drum is equipped with three deep, scoop-like blades, which, in connection with the long, steep angle discharge spout, insures an exceedingly rapid discharge.

The equipment as shown is light and portable, weighing only 2,500 pounds.

For the contractor who does not want to invest the money in a power charger equipment as shown, the



Smith Mixerette with Loader, Gasoline Engine and Pipe Connection. Chute Is in Discharge Position. Three Handles Are Provided So Batch Can Be Dumped from Any Point About the Machine.

Smith Company furnishes the Mixerette equipped with gated batch hopper. Such a rig weighs only 1,875 pounds, and with its low feed level of 3 ft. 10 $\frac{1}{4}$ in., is an equipment which will appeal to a great many contractors.

Special booklet illustrating this machine will be furnished by the T. L. Smith Company, 3136-AA Hadley street, Milwaukee, Wis., on request. Ask for catalog No. 107-AA.

A NEW BRIDGE AND CULVERT FORM

A new type of adjustable bridge and culvert form for arches from 6 feet to 12 feet is manufactured by the Merillat Culvert Core Company, Winfield, Ia., and its use, so far, has developed low cost. The illustration in their advertisement in this issue shows this collapsible form. The height of the arch when fully expanded with this form is 5 feet 2 inches, with proportionate heights for openings of shorter span. The shape of the arch can be changed by raising or lowering the adjustment. After the arches are set up to the desired size, the cover, which makes the form, is placed over them and fastened by means of pins run through the angle irons, which in turn are fastened to the cover itself. When the concrete has hardened the entire form is collapsed simply by removing the jack screws and by turning a crank. After the form has been collapsed, the sheets forming the cover are removed separately, the heaviest single piece of the form weighing 200 pounds. The outside cover is made of heavy galvanized steel strengthened by heavy angles. The entire form can be set up ready for use in but a few hours.

In connection with the use of Merillat culvert forms, some cost information is supplied by the Board of Supervisors of De Soto County, Mississippi. A culvert 3 feet 6 inches in diameter and 25 feet long, with wing walls 10 feet long, 6 feet high and 10 inches thick at both ends of the culvert, was built at Horn Lake in De Soto County at a cost of \$49.80. All the material that went into the construction of the culvert was

THE LOW DOWN FORCE FEED MIXER



has a capacity of from 4 to 12 cu. yards an hour with a forced feed and stroke off measurement different from all others. It gives absolutely perfect proportions whether the materials are wet or dry. Cannot clog. You can set and lock the feed gates so there will be no variation.

Few parts, open-to-view mechanism and low down hoppers make this mixer economical in operation and upkeep. Feed can be changed without stopping the machine. Safety friction clutch enables you to stop or start the machine without stopping the engine. Construction perfect. Price remarkably low.

Find out more of the Low Down's good features. Send for Catalog "B," which gives detailed information. Mention Cement & Engineering News when writing.

ELITE MFG. CO., Ashland, Ohio

NON-FADING—STRONG—DURABLE CEMENT and MORTAR COLORS

To secure an absolutely Non-Fading Mortar Color has been one of the chief aims of architects and builders for years. Probably nothing in their line has so vexed them or caused such disappointment as has this one item. Realizing the full importance of this problem the competing manufacturers listed below have concentrated their efforts toward its correct solution and their success is attested thru the repeated use of their colors by reputable architects and builders throughout the entire country.

RED — BROWN — BUFF and BLACK

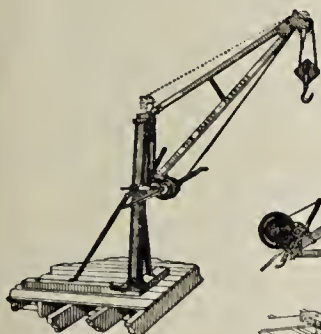
Samples, Quotations and Information on "HOW TO USE and MIX MORTAR COLORS"
May be Secured from Any of the Following Competing Manufacturers of Mortar Colors

CLINTON METALLIC PAINT CO.
Clinton, N. Y.

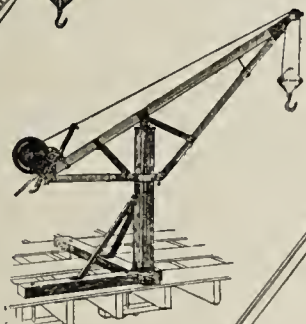
C. K. WILLIAMS CO.
Easton, Pa.

CHATTANOOGA PAINT CO.
Chattanooga, Tenn.

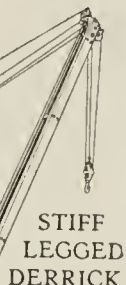
MOST COMPLETE LINE OF BUILDERS' DERRICKS



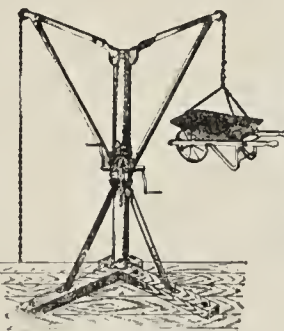
Sasgen's is the oldest derrick house in the country. We make the strongest, best and most reasonable price derricks.



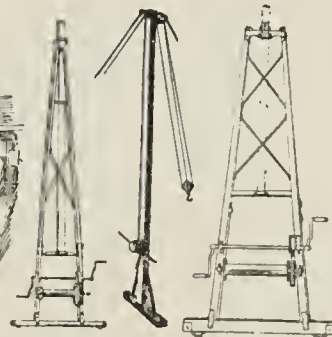
SASGEN DERRICK COMPANY,



STIFF
LEGGED
DERRICK



We manufacture Steel and Wood Circle Swing Builders' Derricks, hand and power. Pole-Setter, "A" Frame, Double Boom Wheelbarrows, Stiff Legged and Guy Line Derricks. Single and Double Drum Geared Winches, Blocks, etc.



2052 North Racine Avenue, CHICAGO

WRITE FOR CATALOG No. 15

TEST AND TRY BEFORE YOU BUY

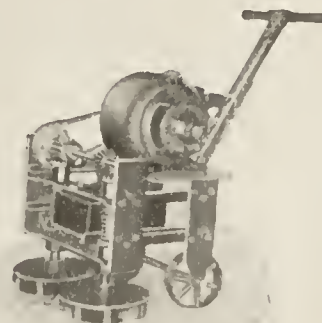
The Schluter Rapid Floor Surfacer



The Schluter BALL BEARING electric floor surfacing machines for mosaic, marble, composition and wood floors are the most simple constructed machines on the market. Direct chain drive AUTOMATIC DUST COLLECTORS. No gears or clutches to wear. Made in various styles.

OVER 5,000 IN USE ALL OVER THE WORLD

Send for prices and free trial proposition



THE M. L. SCHLUTER CO.

225 W. Illinois Street, CHICAGO

shipped from Memphis, and the entire job was done in one day by an inexperienced crew. It was figured by the commissioners that a corrugated metal culvert of like size would have cost \$90 delivered at the station, so that there would still have been in addition cost for hauling, for wing walls, trench, etc. The cost of the concrete culvert as built is itemized as follows:

48 bags of cement.....@	\$0.35	\$16.80
10 cubic yards gravel.....@	1.35	13.50
1 foreman, 1 day.....@	5.00	5.00
1 team and wagon, 1 day.....@	3.50	3.50
5 laborers, 1 day each.....@	1.50	7.50
Lumber		2.50
Incidental expense, nails, wire, etc.....		1.00

Total.....\$49.80

HOW TO CONCRETE IN COLD WEATHER

An entirely new discovery has enabled the laying of concrete in cold weather without the usual methods resorted to of covering with straw or canvas, heating waters, keeping fires, etc.

This mixture is the invention of an eastern inventor and great things are claimed for it. Following is a letter from one user in Boston, Mass.:

Lansing Co.,

Lansing, Mich.

Gentlemen:—

Replying to yours of the 19th in relation to Frostproofing. Will state we have used this on a fireproof garage which we built for ourselves late last fall and in freezing weather. We put on a reinforced concrete roof, using the Frostproofing as directed. The following day we trowelled and finished the roof without the concrete freezing.

The temperature did not go below 20° at the time we started to pour the concrete, but we had a very severe snow-storm within a few days after the job was finished and the snow laid on the roof for two or three weeks. When it was cleared we found the roof to be in the same condition as it was before the snow-storm, which was perfectly satisfactory.

Yours truly,

W. A. MURTFELDT Co.

The Lansing Company will send to all of our readers complete data, tests, and full information on this material, and we would recommend everyone having concrete work to do to write Lansing Company, Lansing, Michigan, for full particulars. Sample sacks can be ordered of the material in 15-pound bags at \$1.00 each for test purposes.

KENNEDY-STROH CORPORATION

The KENNEDY-STROH CORPORATION of Pittsburgh, with a capitalization of approximately two and one-half million dollars, has taken over all the rights, processes and factories of the Kennedy Manufacturing & Engineering Co. of New York, the Stroh Steel Hardening Process Company, the Lawrence Steel Casting Company and the Best Manufacturing Company of Pittsburgh, Pa.

They will operate as a main plant the factory at Oakmont formerly operated by the Best Mfg. Co., also the old Lawrence Steel Plant at 32nd St. and A. V. R. R., Pittsburgh, as the Lawrence Department.

The Kennedy line of mining, crushing, cement making and conveying machinery is one of the most extensive of American manufacture.

The Stroh Steel Hardening Process is a method of casting two kinds of steel in one solid casting in such a manner that the hard alloy comes on, and only on, the parts which are subjected to wear.

The Lawrence Steel Casting Company, which was established in 1883, is one of the first concerns of its kind in the Pittsburgh District, and is both well and favorably known.

The Best Manufacturing Company has been manufacturing a superior line of power piping, flanges, fittings and valves for thirty years and has some of the largest installations in service in the United States.

Mr. W. H. Schoen, formerly connected with the Schoen Pressed Steel Company—now the Pressed Steel Car Company—is President of the new Corporation and will be the active business head.

Mr. J. E. Kennedy, who will be Vice-President and Chief Engineer, has been recognized as the leading designer of mining, and other machinery which bears his name, for more than twenty years.

Mr. J. L. Kendall, of the Kendall Lumber Company and allied interests; one of the most prominent financiers of Pittsburgh, is Treasurer.

Mr. J. D. Hiles, who has been connected with the Best Mfg. Co. for the past fourteen years, is Secretary.

Mr. W. Y. Stroh of the Stroh Steel Hardening Process Co., is General Manager and Metallurgist.

Sales will be handled by—Mr. C. Lee Straub and Mr. H. A. Johann for the Kennedy Mfg. & Engineering Dep't, Mr. John M. Sherrard and Mr. O. L. Mills for the Stroh Steel Hardening Process Dep't., Mr. W. H. Green for the Lawrence Steel Casting Dep't., and Mr. B. Floersheim and Mr. J. W. Prenter for the Best Mfg. Dep't.

The central plant of the Corporation, which is located in the heart of the Pittsburgh Mill District, was originally constructed by the late R. T. Crane of Chicago, and is still considered a model factory.

Extensive additions are being made to these already fine buildings and equipment, which, when completed, will give extensive facilities for high grade work and employment to not less than 2,000 men.

The success of this Corporation is assured from the fact that they already have under contract for 1915 more than one million dollars' worth of business.

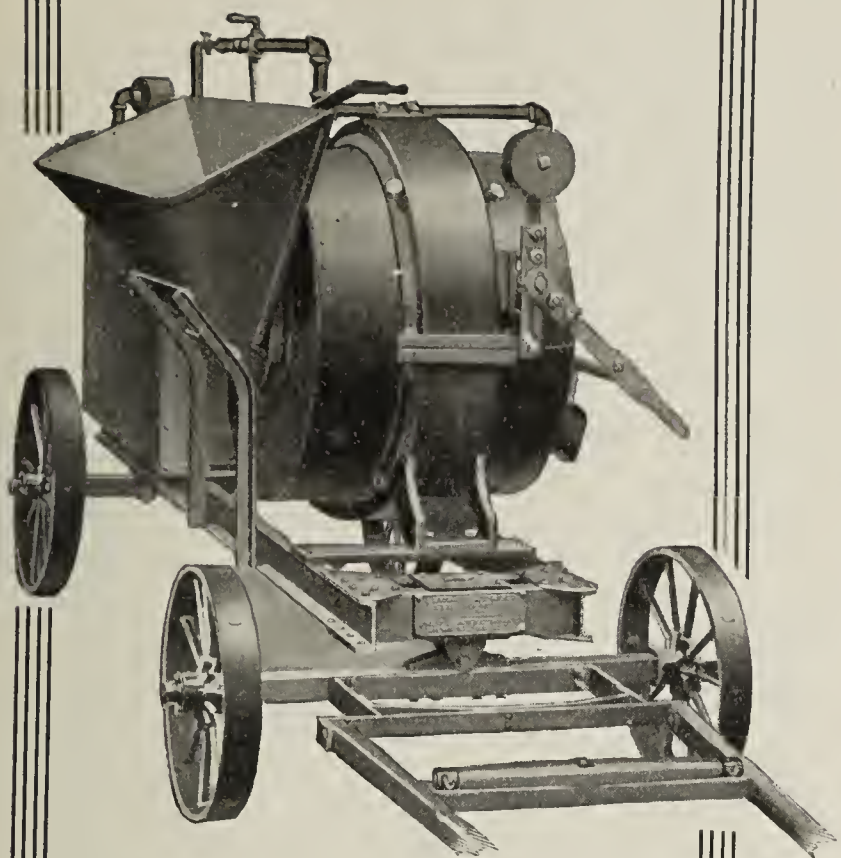
MEDUSA WATERPROOFING PATENT SUSTAINED BY THE U. S. COURT OF APPEALS

The United States Court of Appeals, Seventh Circuit, rendered a decision on January 4, 1915, fully affirming the decision of the U. S. District Court, Northern District of Illinois, rendered February 13, 1914, by which the Newberry patent No. 851247 was declared to be good and valid, and that the McCormick Waterproof Portland Cement Co. infringed said patent. All makers and users of waterproofing compounds please take notice. A copy of the decree, in pamphlet form, sent on application to Sandusky Portland Cement Co., Sandusky, Ohio.

CONCRETE PAVEMENTS

The city of Indianola, Iowa is staking \$90,000 on the utility of cement for paving. The mooted question as to the durability of cement paving has been going the rounds of Iowa cities in the last few years, but there is no definite answer yet. Practically all of Iowa's cement paving has been laid in the last ten years, and no definite proof can as yet be given, but someone evidently must go ahead and try it, so Indianola has just completed an order of something like five miles of it. All the work was done last summer.

A force of forty cement workers, in addition to twenty teams and drivers, was busy the entire summer with the work, which was rushed to completion before cold weather would interfere with the work and injure the cement.

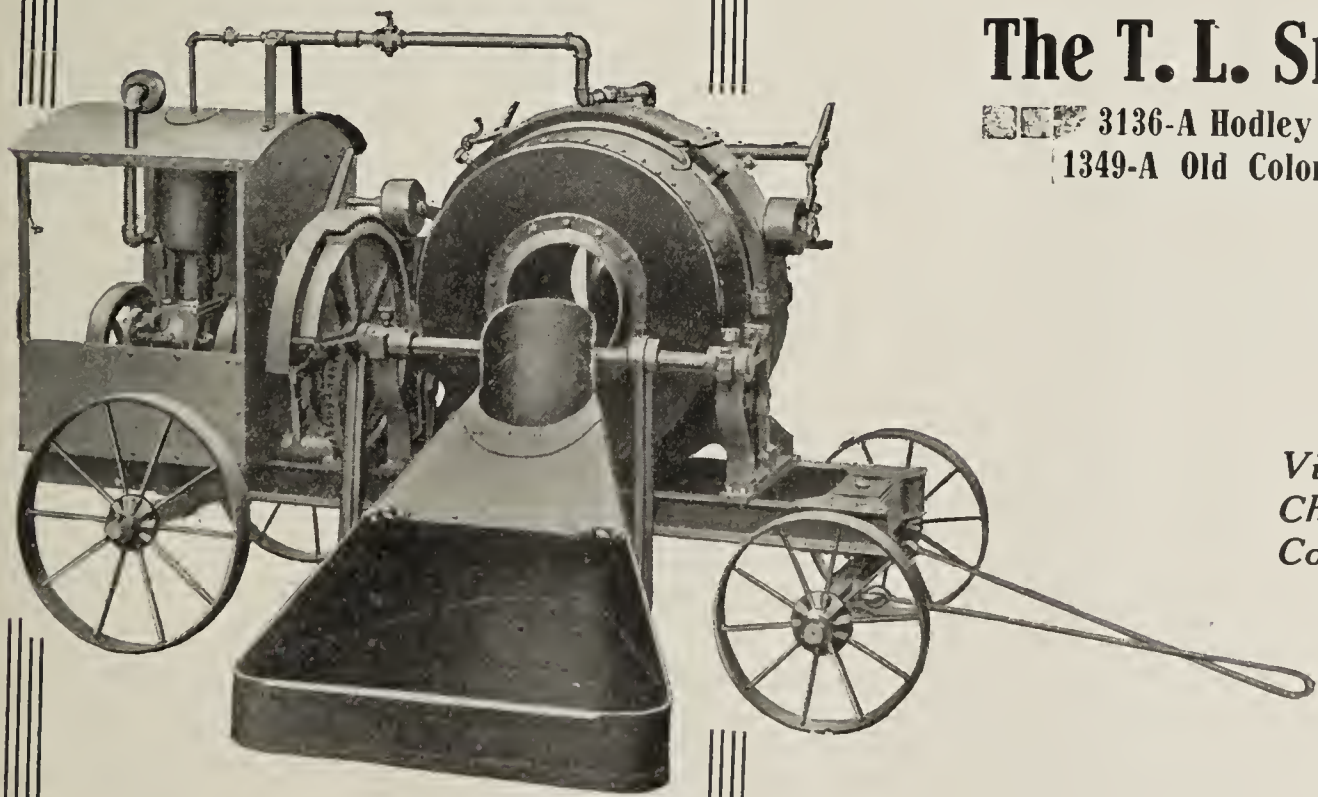


\$246 F. O. B. Factory

Smith Mixerette on steel truck, with 2 H. P. gasoline engine, and steel house. Mixer equipped with waist high, gated batch charging hopper.

Smith Mixerette with ground level power charger. This loader is gear driven. It lifts easily and rapidly without straining the mixer.

\$315 F. O. B. Factory



EFFICIENCY PLUS—and The SMITH MIXERETTE

The following partial specifications show the real efficiency of the Smith Mixerette for the small concrete job. Read them carefully. You'll realize then what a dandy little mixer this is.

Enclosed Gear Ring—Big drum ring and driving pinion enclosed and protected against dirt and dust. Ring fits snugly into casing, the machined surfaces forming a perfectly true sliding bearing. Pressure grease cups lubricate the sliding bearing. The big drum gear splashes through an oil bath on every revolution.

No Main Rollers, Shafts or Boxes—Gear casing forms pedestals which are securely fastened to truck frame.

Ropeless Power Charger—Gear driven skip eliminates hoisting cable, sheaves and drums. Lifts easily and smoothly without the twisting, jerking motion common to pivot type loaders.

Low Feed Level Batch Hopper—This hopper is only 3 ft. 10¼ inches above ground. With its low flaring opening it can be loaded with ease.

Truck—4 inch steel channel sills, 2 inch square steel axles, 20 inch and 26 inch wheels.

Capacity—5 cu. ft. loose material, 3 cu. ft. mixed concrete per batch, 5 cu. yds. per hour.

Efficiency Plus—Back of the Smith Mixerette are 14 years of experience in building mixers for every class of work large and small. Write for special Proposal and Catalog No. 107-A.

The T. L. Smith Company

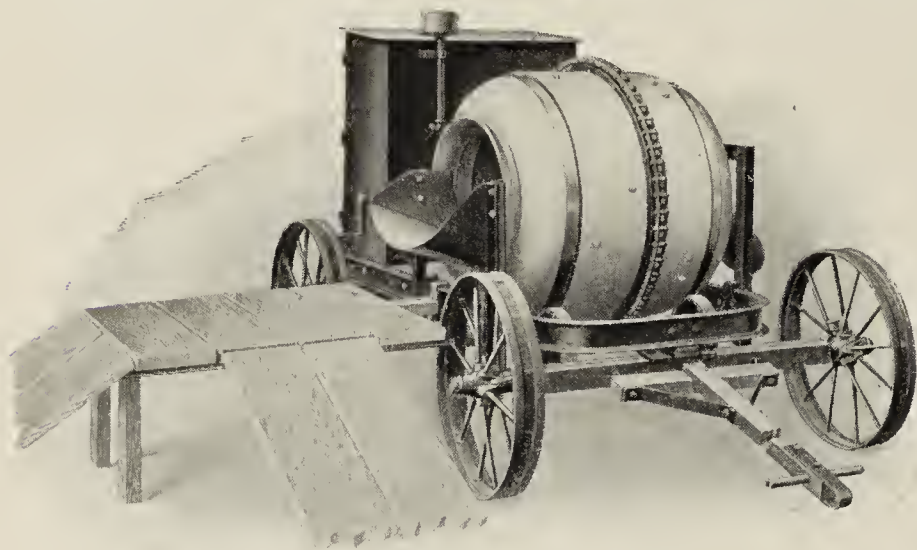
3136-A Hodley Street, MILWAUKEE
1349-A Old Colony Building, CHICAGO

Visit Our Booth at the
Chicago Cement Show—
Coliseum—Feb. 10-17.
BOOTH 93

THE REX MIXER

The REX mixer offers the contractor an opportunity to obtain at a reasonable price a high quality, low charging machine. We are able to sell this mixer at a low figure on account of the low feed which does away with the power loader or side loader that is generally used on our Chain Belt mixers. The REX is designed for the contractor who builds concrete silos, culverts, basements, floors and other work where the purchase of a higher priced machine would not probably be justified. We are also able to sell this quality machine at a low figure for the reason that we manufacture all of our parts except the gasoline engine. We own and operate our malleable iron, grey iron and steel foundries, machine and structural shops. The Chain Belt Company have been manufacturing machinery continuously for twenty-five years and have been manufacturing concrete mixers for eight years. Chain Belt mixers are known the world over for service and reliability and have been used on some of the most important jobs in this country and it has been our aim in designing the REX to make this machine just as good as the larger Chain Belt Mixers.

The REX mixer has a capacity of 6 cubic feet of loose materials or 5 cubic feet of mixed concrete per



The Rex Mixer.

batch and will thoroughly mix and discharge a batch of concrete in about 45 seconds.

The charging platform is extremely low, being about 18 inches above the ground. A steel ledge is placed on both edges of the platform for supporting the plank runways. It is only necessary to run the wheelbarrow up a very easy incline in order to charge the mixer. The charging opening in the mixer drum is 21 inches in diameter and all material enters the drum at once from the wheelbarrow without spilling. We furnish the platform but do not furnish the runways. The platform can be quickly detached and placed onto the machine when moving the mixer.

The discharge chute is of the pivoted type. A batch of mixed concrete can be discharged in from 8 to 10 seconds. The lower end of the discharge chute is 20 inches above the ground, which is amply high to discharge the mixed concrete into the wheelbarrows.

All materials entering into the construction of the REX mixer are steel or refined semi-steel, the only timber parts being the tongue and the charging platform.

The drum is of cast semi-steel, made in two sections, bolted together in the middle. This drum is exceptionally hard, tough and durable and will outwear several drums that are made of plate steel, for in addition to the great durability of the semi-steel mixture, the walls are several times thicker and have no rivets to work loose. The sprocket teeth are cast in sections which are bolted to the drum. They are amply strong to withstand any strain they may re-

ceive in operation, but if through some accident a tooth should be broken, it can be replaced in a few minutes' time at a very small cost. The mixing blades carry the material in a very rapid manner from the large charging opening toward the center of the drum, where it is carried upward by discharging buckets, and drawn back again into the mixing blades. The mixing operation is three-fold and insures a very rapid mix and an absolutely uniform quality of concrete in a few turns of the drum. The drum is supported on large chilled tracker rollers which are lubricated by means of compression grease cups. The face of the tracker rollers are chilled like car wheels and cannot wear flat or oval, which insures a true running mixer drum.

The REX mixer is driven by Riveted Chain Belt, which is the most efficient and durable drive ever placed on a concrete mixer.

The frame is constructed of heavy steel channels and thoroughly braced, thereby allowing no opportunity for the machine to get out of alignment.

This machine is furnished with a Novo 3 H.P. Gasoline Engine, which is a reliable outdoor engine, simple in construction and particularly adapted for use on contractors' machinery. The Novo engine is a vertical, hopper type, water cooled, 4-cycle engine and is entirely enclosed by a steel housing. This engine is frost proof and can not be damaged by the water freezing and can therefore be used in the most severe climates. The Novo engine is light in weight and has no complicated or delicate parts to annoy the inexperienced operator. The fuel supply is carried in the base of the engine and is sufficient for a day's run. The steel housing is amply large and has room for the battery box as well as all necessary tools, oil cans, etc.

The countershaft which the engine drives is equipped with a friction clutch so that the engine can be started without turning the mixer drum. Very few manufacturers of the smaller mixers use a friction clutch, but rely for the most part on the ordinary jaw clutch.

We have considered very carefully the fact that a machine of this type will be hauled over all kinds of roads and we therefore equipped the REX mixer with large diameter road wheels and made the gauge of the road wheels the standard wagon gauge. The road wheels on the REX mixer are 28 inches in diameter with a 4 inch face.

Every machine is thoroughly tested on its own power and is rigidly inspected before leaving our plant.

The REX mixer is guaranteed for a period of one year against inherent defects in workmanship and material and we will replace any parts that are defective F. O. B. Milwaukee. This guarantee does not include the Novo Gasoline Engine, but this has the same guarantee placed upon it by the Novo Engine Co.

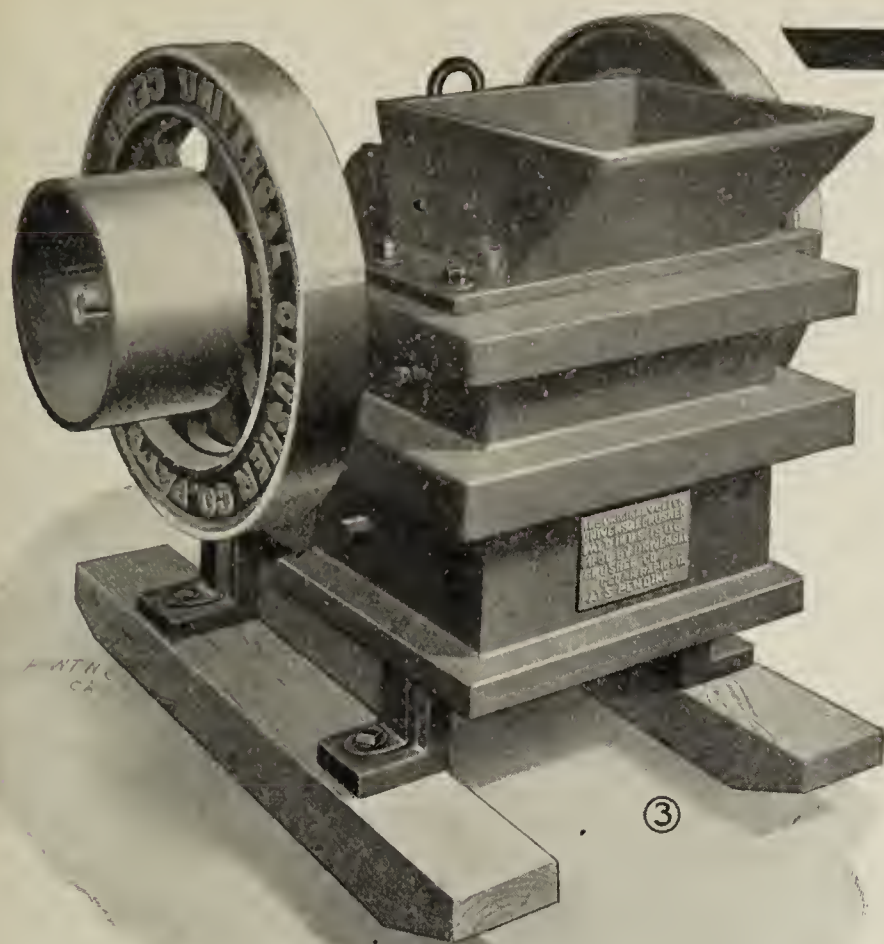
The price of this machine is \$275.00 F. O. B. Milwaukee. Write the Chain Belt Company, 11th Ave., Milwaukee, Wis., and ask for catalog No. 56.

CONCRETE BUILDING

Five hundred thousand feet of lumber has been utilized in making forms for construction operations on the new \$1,000,000 home of the J. W. Robinson Company at Seventh, Grand and Hope Streets, San Francisco.

These forms now are in position and tomorrow the work of pouring cement for the first floor of the superstructure will be started.

In the construction of the building, which will be seven stories and basement, there will be used a total of 30,000 barrels of cement which will surround 2,000 tons of steel.



EXCELS all others in ease of operation. In the light of experience the Universal and Eureka Roll Jaw Force Feed Rock Crushers have proven their worth. Every machine can be instantly adjusted so it reduces rock to any size you want. We are the originators manufacturing twenty-two different sizes ranging in capacities from 5 to 300 tons per day, have small crushers for Block and Tile Plants from \$100 up, guaranteed to do the work or money refunded. Crushers can be returned any time to apply on the purchase price for larger machines. Go to the Chicago Cement Show to be held in February. Make our booths 146 and 155 your headquarters or write for folder No. 11.

Universal Crusher Company,
Cedar Rapids, Iowa, U.S.A. Dept. CE.



"Stag Brand" Manganese Steel Castings

Edgar Allen American Manganese Steel Co.
CHICAGO, ILL. NEW CASTLE, DEL.

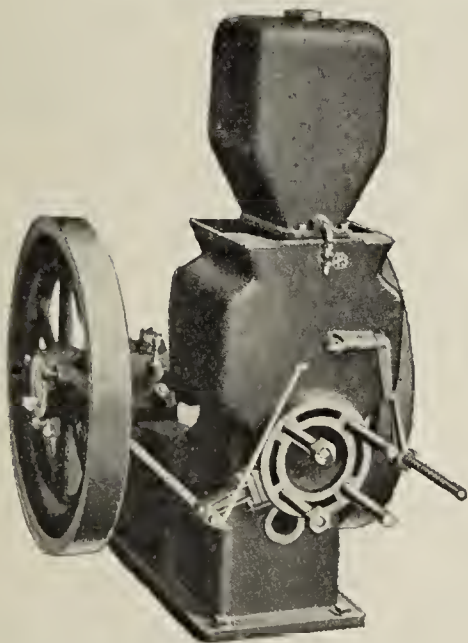
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(4 H. P. Type with Cylinder Head Removed)

We are now prepared to offer you our latest type of KEROSENE ENGINES which have the distinctive features of starting directly on kerosene oil.

No Batteries	No Carburetors	No Hot Tubes
No Magnets	No Torches	No Hot Balls
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Users and owners should know about this efficient and fuel-saving engine. Your correspondence is solicited.

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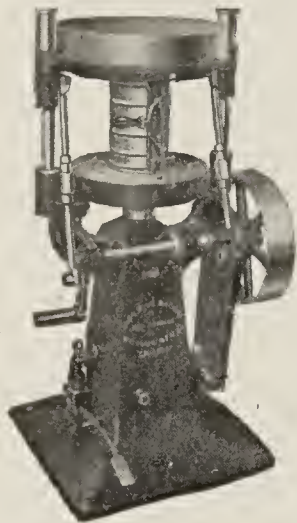


Get the Time-Saving, Substantial, Reliable, Economical Van Duzen Mixer, with or without side loader, used by hundreds of large and small contractors. Capacity 50 to 80 yards per day. Both the Price and Cost of Operation will surprise you.

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Our catalog fully describes these machines

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The Reason Why You Are Not Making Cement Drain Tile Is Because You Have Not Yet Investigated Its Possibilities

The superiority of cement tile for drainage purposes is known; there is no competition in quality or price. For this reason its future use is assured, as well as its present use.

The cement drain tile business does not require a large investment—nor skilled labor—nor hard selling. A few hundred dollars will start you right; you can use unskilled labor; you can sell all the tile you manufacture without any difficulty.

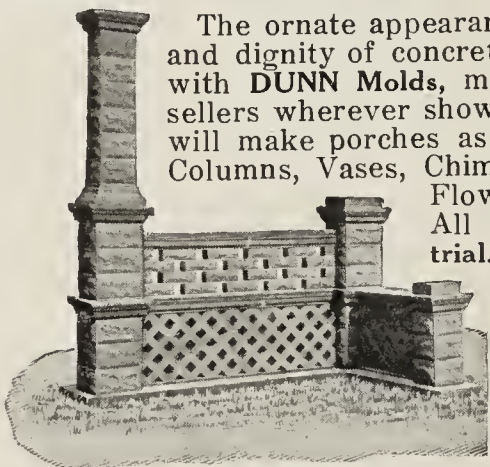
And we are prepared to guarantee profits ranging from \$230 to \$800 a month.

Ask us today for printed proof of comparative costs and profits in making tile; we send this information free upon request.

Dunn equipment is sold on 15 days' trial; write for the tile equipment catalog. Price of Dunn No. 1 Tile Machine.....

\$165

Concrete Porches Pay a Bigger Profit Than You Think.



The ornate appearance, permanence and dignity of concrete porches made with DUNN Molds, make them ready sellers wherever shown. Dunn Molds will make porches as illustrated, also Columns, Vases, Chimneys, Balusters; Flower Boxes, etc. All sold on 15 days' trial.

Write for Porch Mold catalog today. Price of outfit for making porch as shown,

\$39



Don't Tamp Sewer Pipe—POUR IT!

Tamping a semi-dry mixture, to make large drain tile and sewer pipe, is not only slow, troublesome and costly—but unnecessary. Pouring a wet mixture into DUNN Molds, besides being the most efficient method, assures the strongest product. Reduces manufacturing costs, too, and increases the profits.

Dunn Molds permit the manufacture of all size pipe, from 6 to 36 inches in diameter. All sold on 15 days' trial: Pipe Mold catalog gives full descriptions and prices, ask for a copy. Price of 12-inch mold.....

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Pat's No. 842262 and 782700

Here's Mixer Value Out of the Ordinary

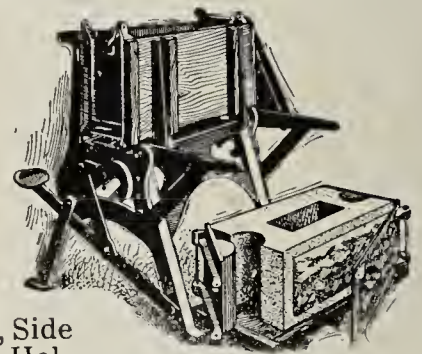
Let facts—not claims—influence your buying judgment. You buy concrete mixers because of what they are, not because of what they are claimed to be. To learn about the Dunn construction is to learn the reasons why a DUNN Mixer is the mixer you have waited for.

Dunn Mixers have four mixing blades and extra long drums, giving them the highest possible mixing efficiency. The convenient loading height and the power discharge feature, save labor. Their capacity—a batch a minute—is assurance of ample speed. The one-piece hollow yoke makes the operation almost noiseless. The all steel and iron construction is evidence of long life.

Write today for catalog describing all styles and sizes. We sell on 15 days' trial. Prices.....

\$67.50 to \$224

Use Three Block Machines—but Buy only ONE



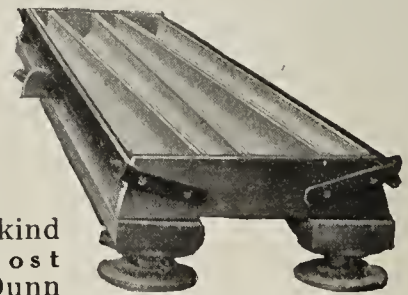
To make Face Down, Side Face and Two-Piece Hollow Wall Cement Blocks usually requires three machines. But one DUNN Combination Cement Block Machine will make all three types. Saves two-thirds the usual investment.

By using a wet mixture it saves considerable tamping, and makes a stronger block. And a special off-bearing system protects each block against breakage. Capacity, 150 blocks daily.

Sold on 15 days' trial. Write for Block Machine catalog. Price.....

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The Concrete Fence Posts that Sell the Quickest



Are those of high quality and moderate price. These are the kind that DUNN Fence Post Molds made. The Dunn system enables quick and economical manufacturing. Tamping is eliminated by our special Vibratory Base which compacts each post to uniform density and firmness. Made in batteries of four and ten. Sold on 15 days' trial. Price of 4-mold battery.....

\$12.50

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W. E. Dunn Mfg. Co.

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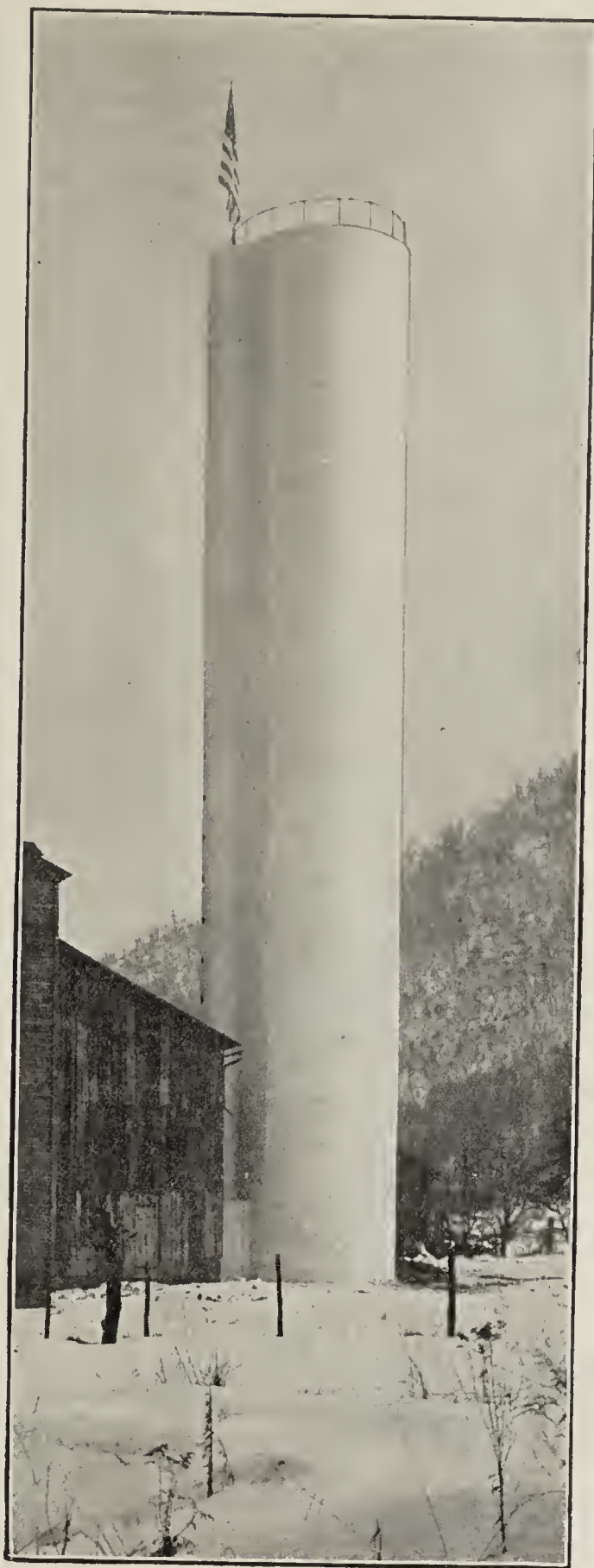


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THE TALLEST SILO IN THE WORLD
A POLK SYSTEM structure, 16 x 108 ft., built by the
Quality Farm Products Co.
Truly a beautiful Silo.

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*February
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1915*

POUND THESE FACTS INTO YOUR BRAIN:

1. The most profitable work open to the concrete contractor is the construction of monolithic concrete silos.
2. The best system for the construction of such silos is the POLK SYSTEM.
3. The best time to order POLK SYSTEM MACHINES is NOW—while you can take advantage of the big Early Order Reduction Sale, which closes February 17, 1915.

We will gladly send particulars

Polk-Genung-Polk Company

Fort Branch, Indiana



"Stonekote" residence of Mr. True at Hinsdale, Ill.

(SEE SWEET'S Catalog for detailed information, etc.)

"Stonekote" Rough Cast

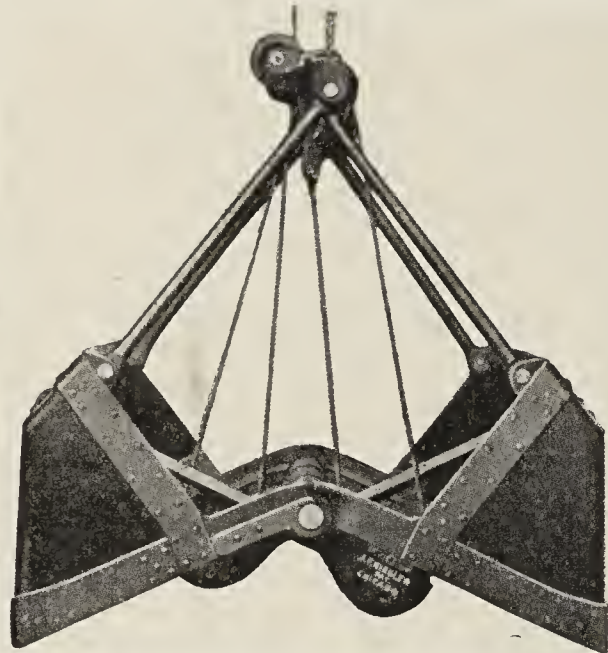
the only cement plaster for all exterior surfaces—rough cast, float coat, trowel finish, or polish finish. As hard as natural stone; made in any non-fading color desired. Stonekote is shipped as a dry material; any mechanic can mix and apply. It is the only perfect waterproof and wear-resisting plastic finish to give permanent and delightful results.

Our 78 page Booklet fully explains what Stonekote is; how and where to use it; and the results to be obtained. This Booklet is free. Write for it.

TOCH BROS. R. I. W. WATERPROOFING MATERIALS

have stood the test and are important adjuncts in making all concrete work and buildings water-proof and damp-proof. Ask for descriptive booklet.

Garden City Sand Co. 25 North La Salle Street
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The Kiesler Grab Buckets

For digging Sand, Gravel, Crushed Stone and Clinker are superior to any other buckets on the market for the following reasons:

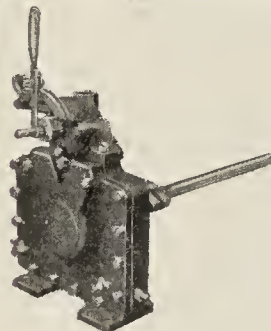
- 1st They have powerful (patented) digging action.
- 2nd They are durable.
- 3rd They are simple in construction.
- 4th Few Parts—Few Repairs.

On account of the EFFICIENCY and SUPERIORITY of our buckets we GUARANTEE them to give full satisfaction

Write for catalog and prices.

Live agents wanted.

Jos. F. Kiesler Co., Sangamon and Pratt Streets
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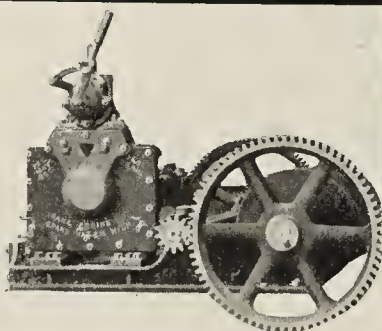


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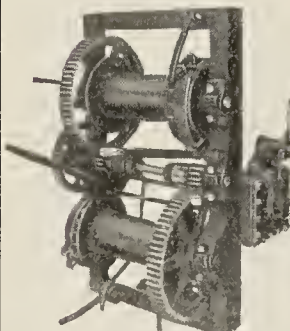
Dake Engine Co.

Grand Haven, Mich.
U. S. A.

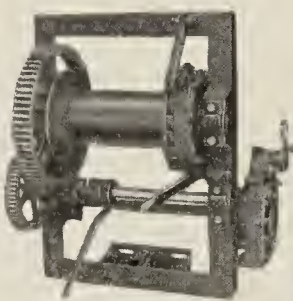
Write for Catalog and Prices



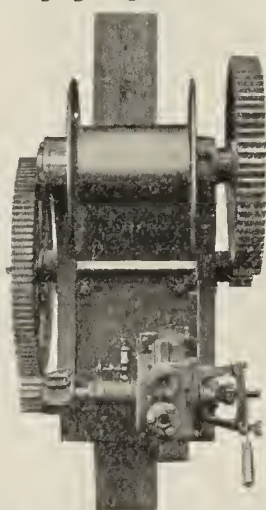
Swinging Engine



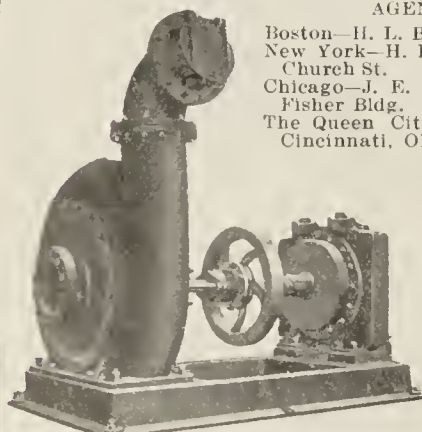
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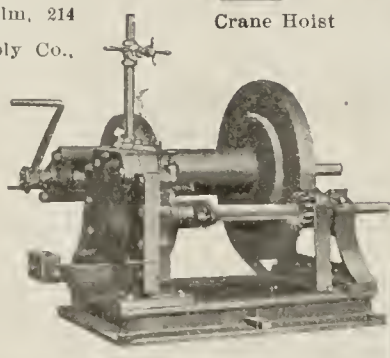
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Crane Hoist

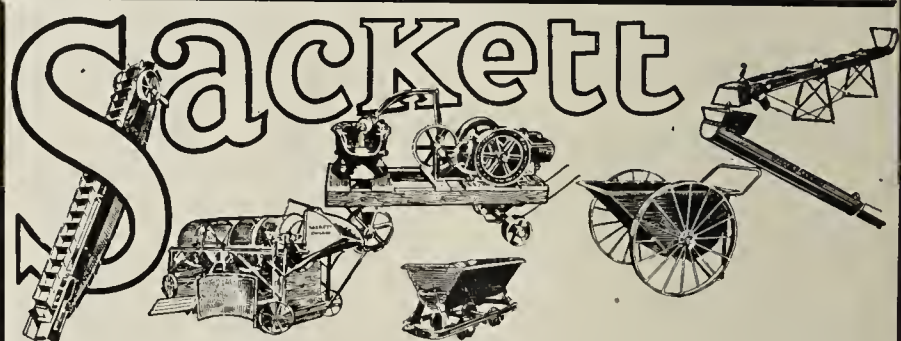


Direct-Connected Centrifugal Pump



Single Drum Friction Hoist

AGENTS:
Boston—H. L. Bond Co.
New York—H. L. Drullard, 30 Church St.
Chicago—J. E. Chisholm, 214 Fisher Bldg.
The Queen City Supply Co., Cincinnati, Ohio.



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Residence, Los Angeles, Cal.
MEDUSA WHITE PORTLAND CEMENT
Used for Exterior Finish

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is guaranteed to be a high-testing Portland, passing standard specifications, and is the first true white Portland ever manufactured. It can be used for exterior as well as interior work, and with it results rivaling that of the best white marble can be obtained. Medusa will be found suitable for building ornamentation, stucco, concrete building blocks, interior decoration, statuary, cemetery work, parks and grounds, tile, mosaic, setting marble, limestone or brick, etc.

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PORTLAND CEMENT

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*Concrete for
Permanence*

Living Rock!

plastic at your wish — eternally hard at your direction — that is Atlas Portland Cement, valued wherever cement is known as "the standard by which all other makes are measured."



For Sixteen Years

the quality of CHICAGO-AA has never varied. A modern mill, a quarry that has no equal, and men who know how to make good cement are responsible for the high quality and attractive uniform color of CHICAGO-AA.

CHICAGO-AA

Portland Cement, made in one mill and from one quarry only, by

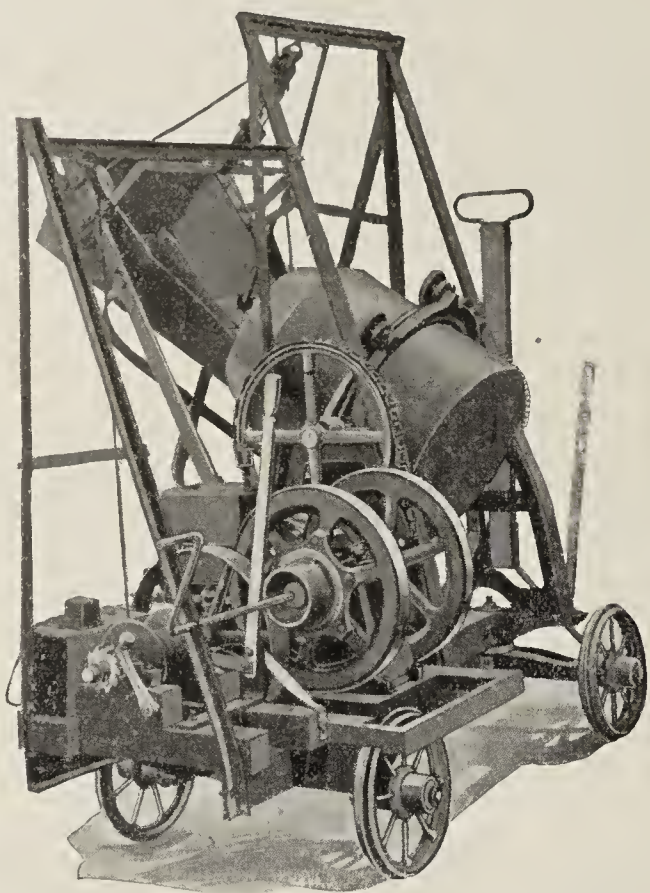
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A Mixer—Not a Separator



The BIG BOSS Portable Concrete Mixing Plant

THIS mixer uses a new and correct construction that positively assures the absolute mixing of every particle of material placed in the drum. Contractors have found this machine to be the most efficient and economical. Built to give service—built for maximum capacity—built to make friends.

These mixers can be furnished without loading attachment, and for hand or belt power.

Manufacturers of a complete line of Cement Machinery, Cement Mixers, Cement Block Machines, Brick Machines, and a large variety of special molds for Porch and Chimney work.

The J. B. Foote Foundry Co., Fredericktown, O., U. S. A.

LITTLE GIANT MIXER

Our Model A, shown herewith, is the most practical Hand Power Mixer on the market. Its blend is perfect and will stand the closest inspection. Its capacity depends upon the power at the crank. A man can turn out from 3 to 5 yards per hour. An engine will double this capacity. We can furnish engines also.

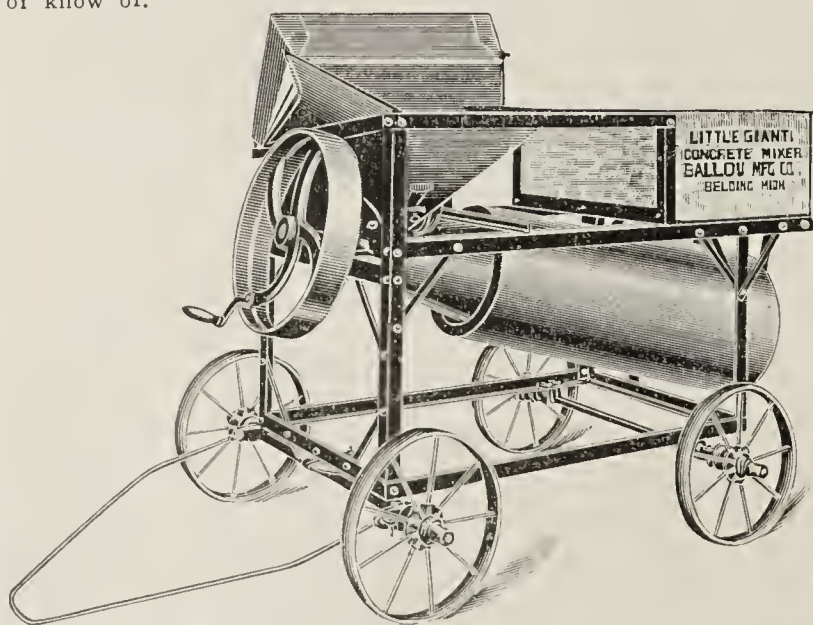
"I have used the Little Giant Hand Power Mixer for two seasons," writes I. J. H. Fender, Coral, Mich. "I have been well satisfied with the ease of operation and the quality and product of the concrete produced."

"With this mixer I put in 260 yards of concrete in two and one-half days on a road bridge in Howard City, Mich."

"I have been using the Little Giant Mixer continuously for all classes of foundation work, and in my block factory for making blocks, bricks and vaults."

"Previous to buying this Little Giant Mixer I bought a batch mixer but discarded it in a short time as it was too slow and practically worthless as a money maker."

"This Little Giant Mixer is a marvel in simplicity, for quality of concrete produced, and the smallness of expense for upkeep, and I would not change it for any other mixer that I have seen or know of."



BALLOU MFG. CO., 99 High Street, BELDING, Mich.

Compactness and Sturdiness Mean Greater Efficiency



The "Excelsior"

was designed and built to set a fast pace for the higher priced mixers and contractors say it does.

Equipped with low hopper; friction clutch; dust proof bearings; 3 H. P. engine. Can be equipped with hoist at small additional cost. Capacity $4\frac{1}{2}$ feet mixed material per batch; easily 65 cu. yds. per day.

Write for illustrated catalog and judge for yourself the extra value of the EXCELSIOR.

Good territory open for agents

Excelsior Mixer & Machinery Co.

606 Merrill Bldg.

Milwaukee, Wis.

AGENTS: Universal Steel Products Co., Chicago, Ill. L. & D. P. Smith, Valdosta, Ga. Loyal Power Co., Omaha, Neb. Manufacturers Supply Co., Minneapolis, Minn. Ward Equipment Co., Pittsburgh, Pa. E. W. Ripley, Farmington, Me.



The Commonwealth Power Co. tunnel under Grand Ave., Milwaukee, Wis., recently successfully waterproofed with

"Hydrite"

COLORLESS WATERPROOFING

Hourly Leakage 5200 Gallons STOPPED! 700 ft. Concrete Tunnel 55 feet below datum was made watertight.

The success of our method eliminated the necessity of pumps and SAVED \$80.00 to \$100.00 PER MONTH.

In addition to the possibility of damage to the cables, etc., from the seepage. This tunnel, 10 years old, has been free from leakage for nine months, or since work was completed. We guarantee it to stay so.

HAVE YOU A WATERPROOFING PROBLEM?

Difficult waterproofing problems in NEW or OLD work can be economically and successfully solved. The experience of a successful organization is at your service and satisfactory results are guaranteed.

Our method of applying grout, internally or externally, under heavy pressure through pipes, or upon the surface, as the conditions require, is applicable to tunnels, reservoirs, foundations, basements, etc., of masonry or concrete construction. Leaks are not only stopped but the structures are strengthened.

Let us help you with your waterproofing problem. Write us concerning our product and methods. Ask for descriptive booklet.

WATERPROOFING COMPANY OF AMERICA
MILWAUKEE, WIS.

Branch Offices:

543 McCormick Building, Chicago. Callahan Bank Building, Dayton, Ohio.
1014 Transportation Building, Montreal, Canada.

Great Profits in Silo Building

Write for the 1915 CATALOG and PRICES on the CONKLIN SILO EQUIPMENT.

We will give you a **Special Price** On All Our Equipment

providing the order is received prior to Feb. 18, 1915.

We Cut Your Expenses **50%**



Write at Once—Your Time Is Short

CONKLIN CONSTRUCTION COMPANY,
430 Main Street, - Hartford, Mich.



Shearer & Mayer Dragline Cableway Excavator

(PATENTED)

A simple, rapid, efficient, economical machine for excavating sand and gravel from wet or dry pits and delivering to screens, bins, cars or storage piles.

It digs, conveys, elevates and dumps in one continuous forward operation. The speed of the dump is under Positive Control of one operator.

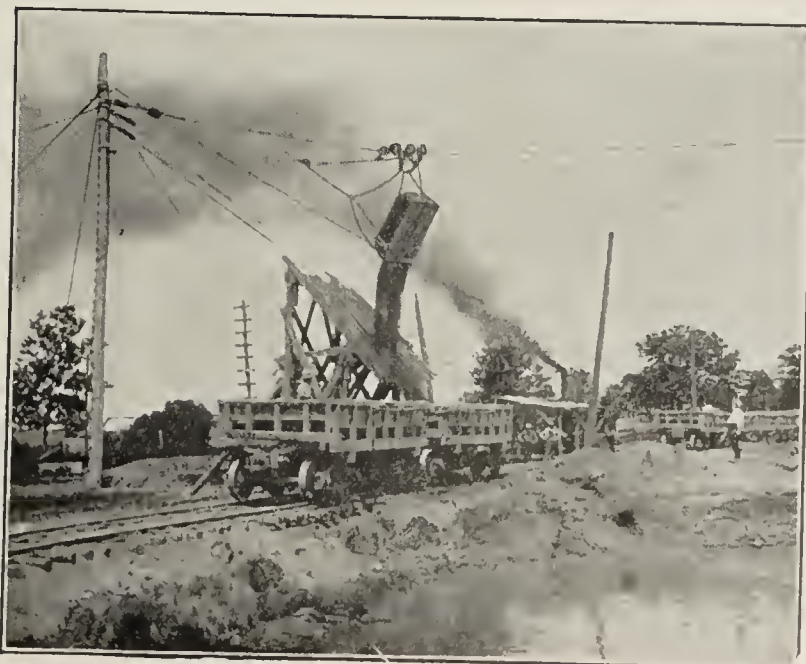
It is a substantially constructed piece of equipment with all parts designed to meet the continuous severe service of gravel excavation. The many machines in successful operation testify to the merits of this equipment.

We invite you to investigate this machine thoroughly before installing any equipment.

Write for catalog and further information.

SAUERMAN BROS.

1139 Monadnock Block, - Chicago
ENGINEERS & AGENTS



Results Secured in the Use of Hydrated Lime in All Kinds of Concrete Construction

By Robert S. Edwards, C. E., Portland, Oregon

In a great many parts of the United States at the present time, hydrated lime has become very favorably recognized and in considerable demand as a suitable product for mixing with concrete to make it dense, and thereby rendering concrete more water-proof. The addition of small percentages of hydrated lime, when making concrete mixtures, is immediately effective in promoting plasticity throughout the mass, thereby rendering the concrete more homogeneous and keeping it so during transit, before placing. After placing concrete which contains hydrated lime, its subsequent spading in the forms is greatly facilitated, and the thorough covering of all steel reinforcing rods is more perfectly accomplished. In fact, concrete mixed with a small percentage of hydrated lime seems to almost automatically fall into place.

The proportion of plasticity and homogeneity, which small percentages of hydrated lime give to concrete, cannot be secured in any other way at so little added expense for the material used. On many large reinforced concrete buildings which are being constructed in the United States today, the concrete is mixed at one or two central mixing plants, which are generally located on the ground or in the basement of the building. After mixing, it is dumped into carriages and elevated, then distributed through galvanized iron pipes or chutes to the various parts of the building. It is a well known fact that Portland cement, when mixed with water, is not very plastic, some brands of cement being extremely non-plastic, and while the mixture for reinforced building construction is a rich one (generally 1-2-4), yet even so, it is sometimes very difficult to secure sufficient plasticity in the concrete to insure its being elevated, poured and distributed without considerable sticking and clogging of the pipes, attendant with more or less separation of the aggregate. An extremely interesting example of the effectiveness of hydrated lime in correcting the last named condition is well worth mentioning.

Hydrated Lime Used in Concrete Work of Two Large Dams

During the fall of 1912 and the winter of 1913 The Stone & Webster Engineering Corporation constructed a large concrete dam located on the White Salmon River, about seventy miles from Portland, Oregon. Our concern, (Edwards & Lazell, Engineers, Portland, Oregon) was retained by Stone & Webster and the Northwestern Electric Company, for whom the dam was built, to inspect the material used in the concrete work. A thorough investigation was made to determine the advisability of manufacturing the sand which was to be used in this work, and it was finally decided to erect a large crushing and sand manufacturing plant and secure both fine and coarse aggregate for the concrete in this manner. The sand was made by crushing a basaltic rock secured from the crusher located on the bank of the stream at an elevation of 600 feet above the river bed. The fine crushed rock was screened through a 1-4 inch mesh, and the fine and coarse crushed rock was stored in bins just above the mixing plant, from which point 80 per cent of the concrete was poured down a spout or chute 400 feet in length to the dam site below. From numerous test results it was decided to use 10 per cent of hydrated lime throughout the concrete, the

mixture being 1-3-6. It is more difficult to secure easy working concrete when using crushed rock as the coarse aggregate than when using gravel, this being due to the angularity of the crushed rock. In this case we not only had to contend with the crushed coarse aggregate, but sand sized material was also angular, in fact, to such an extent that the concrete mixture would not flow down the steel lined chutes without mechanical aid. By the addition of 10 per cent of hydrated lime, or approximately 40 pounds of hydrated lime per yard of 1-3-6 concrete, we literally transformed the physical appearance of the concrete as seen in the chutes. The concrete would leave the mixers, pass into the chutes and then onward without the slightest separation of the aggregate and would finally arrive at the dam in a perfectly homogeneous mass, where it would flatten out to a level with but little shoveling and spading in the form. The hydrated lime, together with proper mixing, had given the concrete sufficient plasticity to destroy the excess friction caused by the angular condition of the fine and coarse aggregate, and formed a smooth flowing, uninterrupted stream of concrete, to be deposited in its final resting place in the dam.

Without the use of hydrated lime in this work, it was actually demonstrated that it would have been impossible to secure satisfactory results without discarding the conveying of the concrete in chutes and instituting a far more expensive method of handling the concrete.

The writer has considerable data touching upon the use of hydrated lime in other important concrete structures, such as reinforced concrete conduits, floor slabs in building construction, concrete silos, and in lining tunnels with concrete, but it is quite satisfactory to have absolute record of its use in such important work as that noted above. Another instance where hydrated lime was used to great advantage and with considerable economy as compared to other water proofing compounds considered for this work, should be mentioned.

In 1910 the Portland Railway, Light & Power Company constructed a large, hollow reinforced dam across the Clackamas River, some 30 miles from Portland. The construction of this type of dam was a new departure on the Pacific coast and the work was undertaken with great care. The dam was 90 feet high, over 600 feet long, and hydrated lime was used in all the concrete which was to be exposed to water pressure. All of this work was of reinforced concrete, with reinforcing steel closely spaced on centers. The aggregate was carefully graded sand and gravel, concrete mixture being 1-2-4 with 7 to 10 per cent of hydrated lime added to the weight of the cement per yard of concrete. The concrete as poured was plastic and homogeneous and went into place with extreme ease, while the finished concrete was uniform and dense and absolutely impervious to the flow of water.

These specific records of the use of hydrated lime in the concrete work of two of the largest hydro-electric developments on the Pacific coast during the last 4 years, serve as convincing engineering proof which can be readily verified, that hydrated lime is a product of great intrinsic value and one that can be used with utmost safety in concrete work for the purposes named above.

Below are some notable concrete structures recently built in which Hydrated Lime was used in the concrete work to make the concrete dense and thereby rendering the concrete more water proof:

Full detailed information of the methods and cost of using Hydrated Lime may be secured from any of the following manufacturers of Hydrated Lime:

Longview Lime Works,
Birmingham, Ala.

Charles Warner Co.,
Wilmington, Del.

Marblehead Lime Co.,
Chicago, Ill.

Ohio & Western Lime Co.,
Huntington, Ind.

Security Cement & Lime Co.,
Hagerstown, Md.

Lee Lime Co.,
Lee, Mass.

Charlevoix Rock Product Co.,
Charlevoix, Mich.

White Marble Lime Co.,
Manistique, Mich.

Glencoe Lime & Cement Co.,
St. Louis, Mo.

Dutchess County Lime Co.,
Dover Plains, N. Y.

Rockland & Rockport Lime Co.,
101 Park Ave., New York, N. Y.

Charles Warner Co.,
103 Park Ave., New York, N. Y.

Union Lime Co., Pabst Bldg., Milwaukee, Wis.

Kelly Island Lime & Transport Co.,
Cleveland, Ohio.

National Lime & Stone Co.,
Carey, Ohio.

John D. Owens & Son Co.,
Owens, Ohio.

Woodville Lime & Cement Co.,
Toledo, Ohio.

Charles Warner Co.,
Land Title Bldg., Philadelphia, Pa.

National Mortar & Supply Co.,
Pittsburgh, Pa.

Gager Lime & Mfg. Co.,
Chattanooga, Tenn.

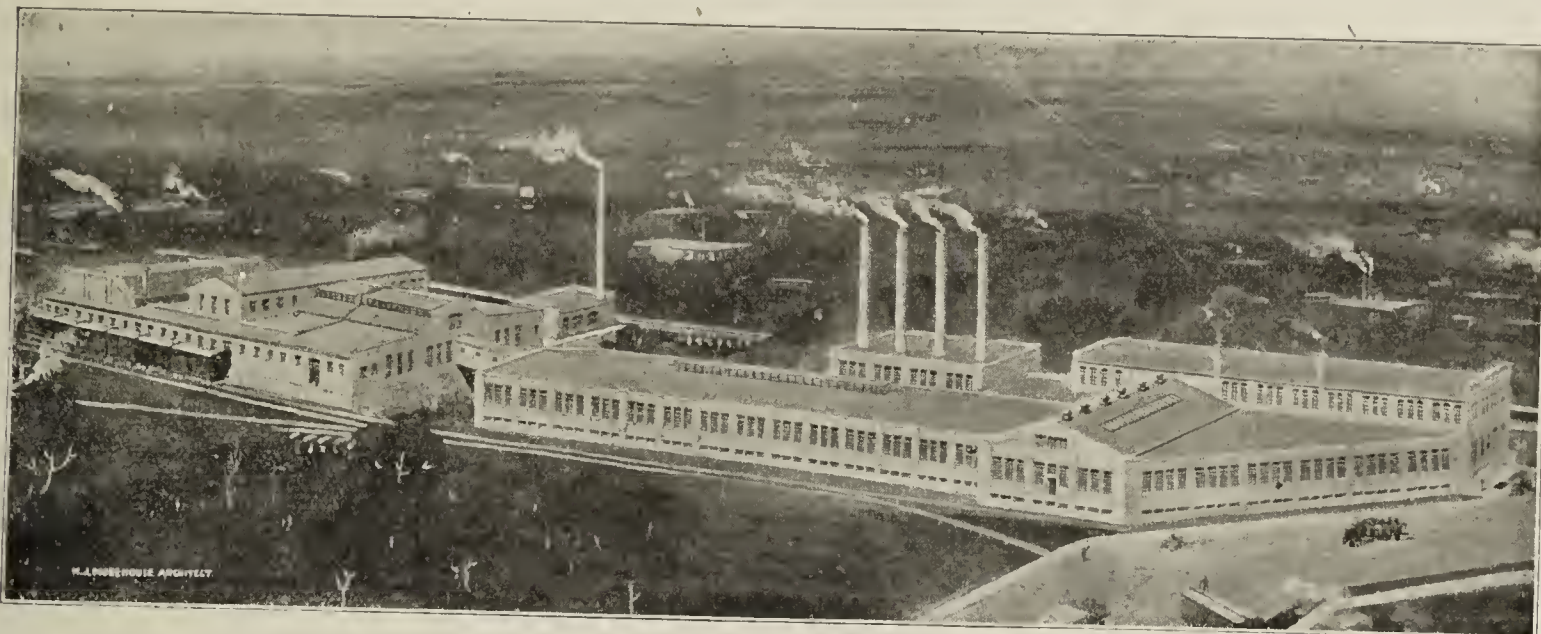
Dittlinger Lime Co.,
New Braunfels, Tex.

Round Rock White Lime Co.,
Round Rock, Tex.

Riverton Lime Co.,
Riverton, Va.

International Lime Co.,
Sumas, Wash.

Stadard Lime & Stone Co.,
Fond du Lac, Wis.

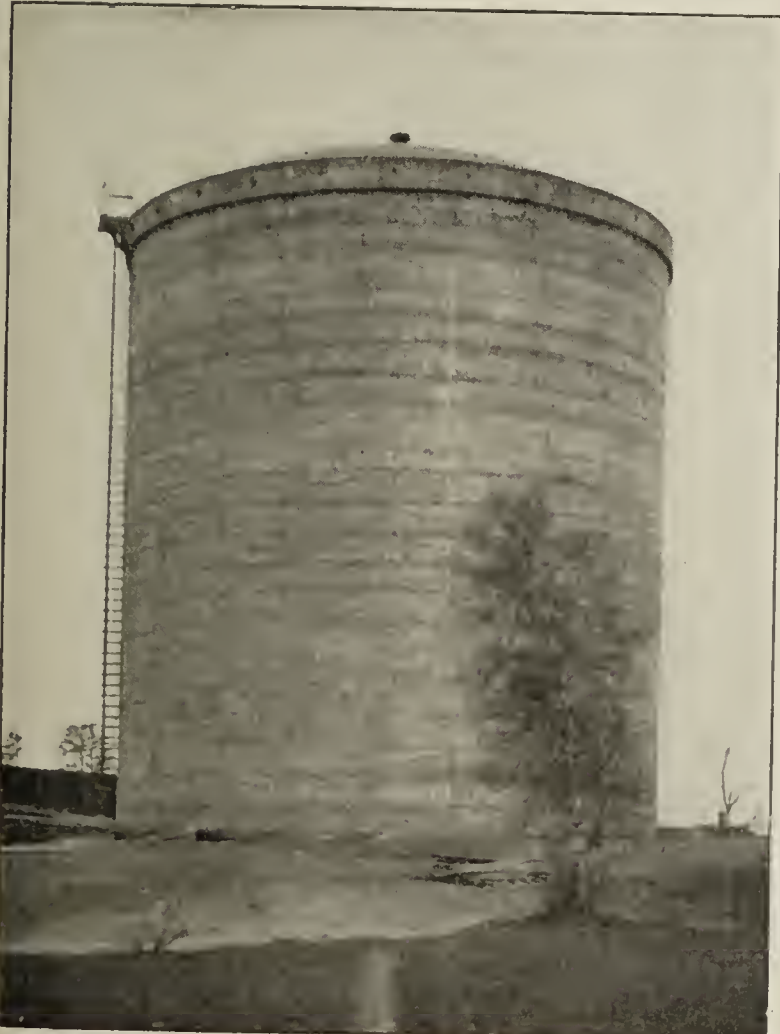


To protect a basement of 31,500 sq. ft. of floor space against an eight or nine foot head of water, was the problem that confronted the builders of the plant, shown above, the magnificent home of the Michigan Carton Co., Battle Creek, Mich.

The basement of this plant is 14 feet high, 75 feet wide and 420 feet long. The building stands on very low, marshy ground, on what was formerly, in fact, the bed of the Kalamazoo River. At present, however, the stream has been diverted and flows like a mill race, in times of high water, between the main buildings. At such times the water rises to a depth of 8 or 9 feet above the floor level and the rear wall of the basement must act as a retaining wall against the flood.

"Hydrated Lime" was the happy and effectual solution of this difficult problem and the interesting facts are given by Mr. M. J. Morehouse, the well-known architect of Chicago, who had charge of the work.

The floors and walls are of concrete, both waterproofed, the latter up to a height of 10 feet. The mixture used was one part cement, four and one-half parts of sand and gravel, and seven to eight per cent by weight of cement of "Hydrated Lime."



REINFORCED CONCRETE RESERVOIR, LISBON FALLS, MAINE.
To Make this Reservoir Watertight Hydrated Lime Was Added Equal to 8% of the Cement to the Concrete When It Was Being Mixed.



CLACKAMAS DAM, BUILT BY THE PORTLAND (OREGON) RAILWAY, LIGHT & POWER COMPANY.

90% Portland Cement; 10% Hydrated Lime.

Hydrated Lime is simply commercial lime scientifically slaked in the process of manufacture. It is shipped to you in 40 lb. paper bags or 100 lb. cloth bags, and there is no fire risk connected with its storage.

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By A No. 1 cement chemist, 8 years experience as head chemist in cement mill. Will go anywhere and guarantee satisfaction. Address W. B. C., care Cement & Eng. News., Schiller Bldg., Chicago.

POSITION WANTED

as Chief Chemist or Asst. Supt. by graduate chemical engineer; have worked six years in all departments of cement mill,—with present employers 3 years as Chief Chemist. Address H. F., care Cement & Eng. News, 1117 Schiller Bldg., Chicago, Ill.

WANTED.

Wanted to hear from owner of good cement plant. Send cash price and particulars. D. F. Bush, Minneapolis, Minn.

Second hand Kent mills. Marsh Co., Old Colony Bldg., City.

FOR SALE

**Two Second-Hand
No. 8 Krupp Ball Mills**

**Fully Equipped,
In Excellent Condition**

**Security Cement & Lime Co.
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A fine opening for a man with moderate capital to engage in the general concrete business right beside the largest pile of sand and gravel in Illinois. Free land and free switch. For further particulars address S. W., care Cement & Eng. News, Schiller Bldg., Chicago, Ill.

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1—No. 4 Champion 1—9"x16" Climax
2—Eureka Crushers and Pulverizers, Capacity 5 to 300 tons per 10 hours.
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½ yd. ¼ yd. 1 yd. and 1¼ yd. Clam Shell and Orange Peel Buckets.
1—Drag Line Cableway Excavator
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1—Centrifugal Sand Dredging Pump
10—2 to 20 yd. Dump Cars
1—Big Blast Hole Driller

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NEW BOOKS

Rock Drilling. By B. T. Dana and W. L. Saunders. Pp. 319; ill., index. For sale by the Cement & Engineering News, 1117 Schiller Bldg., Chicago. Price \$4.

Following a general introductory statement covering blasting and explosives, this volume treats in detail the methods and costs of open-cut excavation and submarine rock-drilling. It is based principally on material collected and compiled by engineers of the Construction Service Co., and includes accurate records of cost and drill duty in many kinds of work. Diagrams and tables are freely used in such shape as to make more than a mere record of cost. Accurate comparisons and analyses become easy. The book is well written and well illustrated and is sure to prove of large value to consulting and constructing engineers.

Reinforced Concrete Construction is the title of a 300-page publication by H. Adams and E. R. Matthews just received from the press. The book contains enough, and fortunately not too much, mathematics to make it interesting and valuable to the reader and treats in an exhaustive and practical manner all branches of reinforced concrete construction. More than 300 cuts illustrating modern work done in concrete add life and charm to the ambitious compilation. No contractor or practical superintendent striving for mastery in this art should be without it. Price, \$3.00; forwarded postpaid by Cement and Engineering News upon receipt of price.



LET US SHOW YOU that there is more money in building concrete culverts over our forms, than in any other branch of your business. One form adjusts to any size from 20 inches to 48 inches in diameter, so you need but one investment for all your culvert work. We also make an arch form, adjusting from 6 to 12 feet. One of these forms will insure you all the culvert building in your vicinity at profits that will exceed any other branch of your contracting. Write at once for free catalog and special offer to contractors.

The Merillat Culvert Core Co.

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FROSTPROOFING

The latest and greatest invention for the contractor and builder. A material that prevents freezing of Concrete, Mortar, Plaster, Whitewash, etc. Tested by experts and prominent contractors and pronounced O.K.

A small amount mixed with the cement or lime keeps from freezing, prevents rusting of forms and reinforcing, and makes stronger concrete. Can be used in the coldest weather with absolute success.

Get the cold weather prices while the warm weather fellow does the loafing. Complete your concrete jobs now instead of allowing them to hang over.

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Get posted on this newest and greatest invention which enables concreting the year around.

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More Power 6H \$98.75 For Less Money 6P

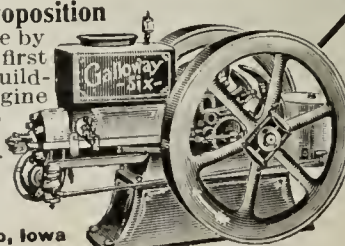


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ARE you the best—not necessarily the biggest—concrete or cement man in your neighborhood?

WOULD you be interested in starting a side line that will some day prove more profitable than your entire present business?

OUR experience makes us willing to offer this proposition to any live man in the cement trade. No matter what net profit you are earning now, we believe we can show you how to ADD 18% a year more profit.

THAT is to say—a man making now only 6% on his capital should clear 24% by adding this new proposition, while a firm with energy and ability, enough now to be clearing 20% in any ordinary business should make 38% with ease.

MOREOVER, he would be building up a business on absolutely the **most stable foundation in the world**—the annual death rate. People stop building, they may stop buying, but they never stop dying.

SUPPOSE you, for example, went into partnership with all your local undertakers—they to sell, you to manufacture—the Norwalk Vault, an airtight, waterproof, steel reinforced cement outer case that does away absolutely with the present barbarous and unsanitary method of burial.

SUPPOSE after paying all manufacturing and overhead expenses, you cleared at least 100% on every vault delivered, and even then left the undertaker an equally generous profit for doing your selling. Suppose, in other words, your sales reached the point where you made \$10 every time a person died in your county—and at the same time performed a real service to your community.

UNDERTAKERS everywhere are waking up to the fearful crudeness of the old fashioned method of burying unprotected in

the muddy bottom of a six-foot cistern. As soon as the public begins to realize there is something better—and we shall see that they begin to before long—the holders of the Norwalk Vault franchise for any given district will have a mighty valuable possession.

FOR the value of each Norwalk territory increases greatly every time a new and hitherto unoccupied territory elsewhere is filled by the right man. And we are filling them very rapidly—only 5 more counties left in the whole of New York State for instance. Yet these territories still unoccupied may be had by the **right man** at a cash outlay astonishingly disproportionate to the possibilities of the investment.

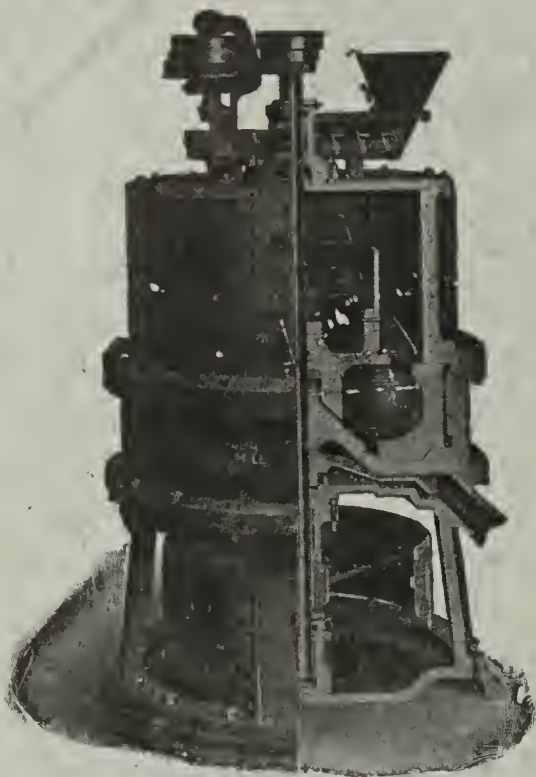
HOW about **your** territory? Are you capable of fitting in with a big national organization and taking care of your town or county? If you are, the amount of money you can make depends only on the size of your territory and your own enterprise. The business is there—waiting!

ON the other hand, this is no get-rich-quick game. To make a success a man must have a little capital and be willing to work hard to build up the business. For the right kind of man, however, there is a very real opportunity; no technical experience is necessary; no expensive factory; no big payroll; no fancy expenses of any kind.

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The Fuller-Lehigh Pulverizer Mill.



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Cement having a higher percentage of Impalpable Powder than can be obtained by any other mill. Tests show that the tensile strength of a 1-5 mortar made with cement pulverized by the Fuller Mill is higher than the tensile strength of a 1-3 mortar made with cement pulverized to the fineness required by the Standard Specifications.

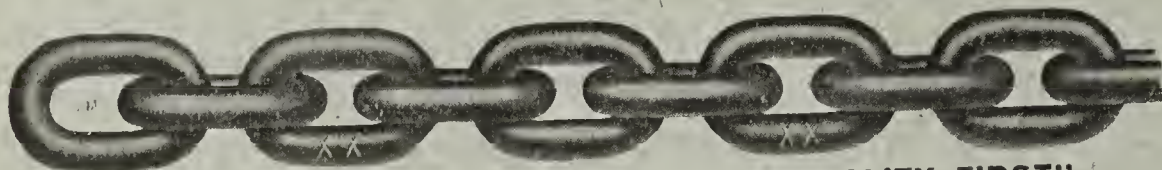
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Cement Companies equipped with Fuller Mills advertise the fact that The consumer gets 38 pounds more of the Impalpable Powder or Real Cement in every barrel of cement produced by The Fuller Mill than by any other.



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"OLD RELIABLE" "XX"—Our Motto is "QUALITY FIRST"
You may buy some cheaper grades of Shovel Chain than "XX" but our High Grade "XX" Chain is always cheaper in the end. Send for catalogue and prices.

Some manufacturers make several grades of so-called Shovel Chain. We make one grade.

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MARCH 1915

CEMENT AND ENGINEERING NEWS

Vol. 27

SCHILLER BUILDING, CHICAGO, MARCH, 1915

No. 3

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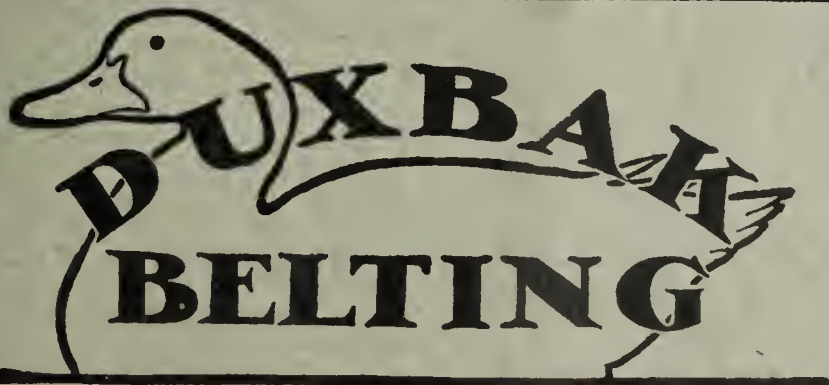
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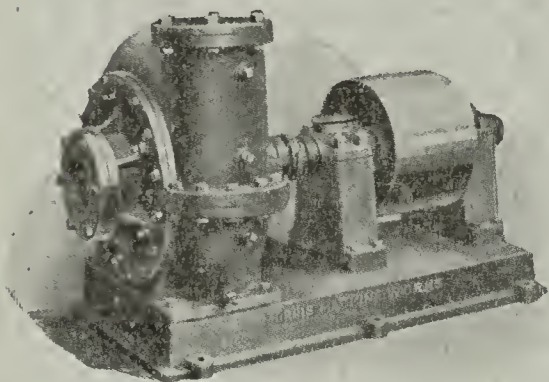
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EVERYTHING that enters into the construction of the Morris Solid Lined Dredging Pump is of heavy proportions and the general design is such that wear is reduced to the smallest possible extent. Its ability to outlast other dredging pumps is its chief claim to economy.

By removing the upper half of the pump shell, the lining can be taken out or by removing the disc on the pump shell and the inner disc on the lining, the runner can be taken out. The pump is easily and quickly taken apart if necessary to replace lining or piston.

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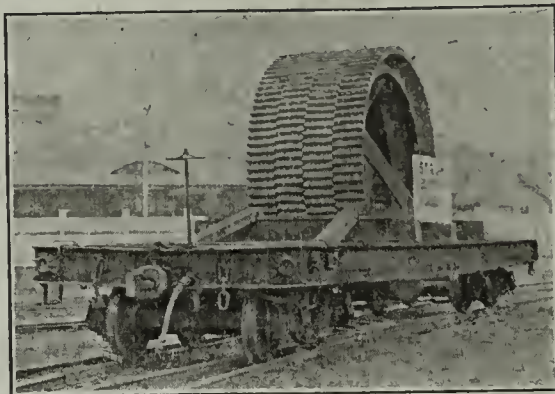
Morris Machine Works

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Stroh Process



First shipment of gears for Universal-Portland Cement Company's plant of Duluth which is being equipped with Stroh Process Gears and Pinions.

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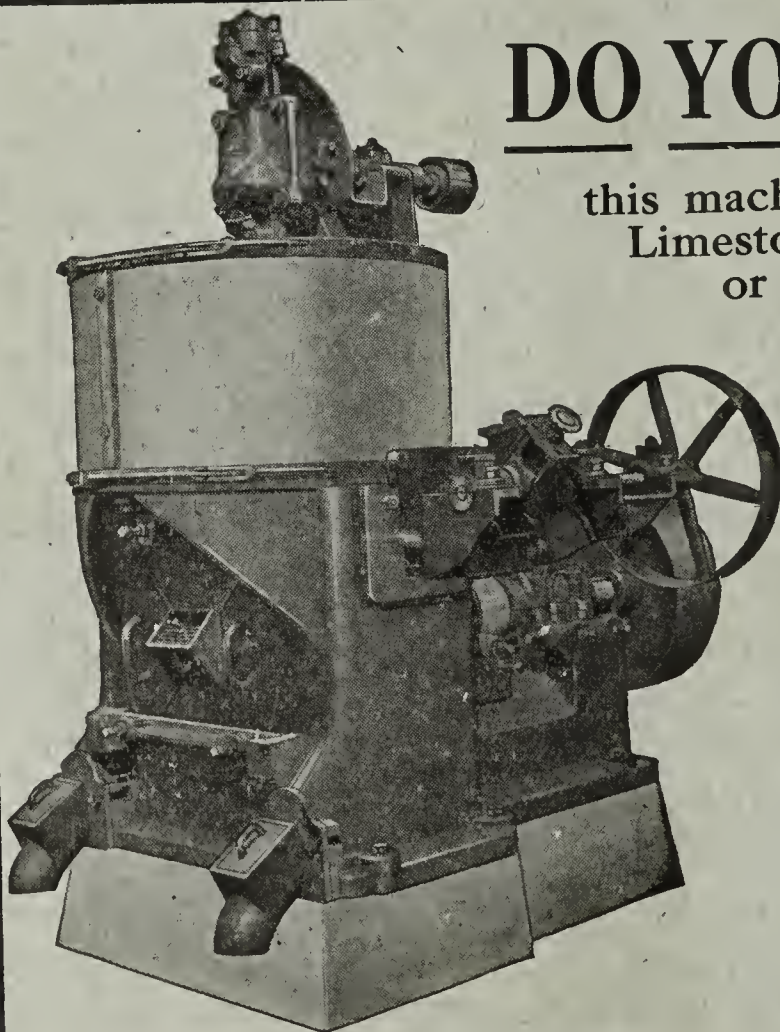
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DO YOU KNOW

this machine will grind
Limestone, Clinker
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FINISH IT
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6-8 Tons Limestone
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PER HOUR

**SIMPLIFIES
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Is rapidly showing the cement world that a successful preliminary pulverizer is obtainable. The Ball Mill and Kominuter have seen their day. The Hercules Mill has succeeded them in Five Large Cement Plants and many other companies will follow suit when conditions warrant.

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You know it is on the way, and when it arrives you should have the largest and most economical grinding machinery possible. Large units mean economy. The Hercules is the largest pulverizer unit manufactured and has demonstrated its practicability to many large producers.

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THE GIANT GRIFFIN MILL—The Most Successful Single Stage Pulverizer



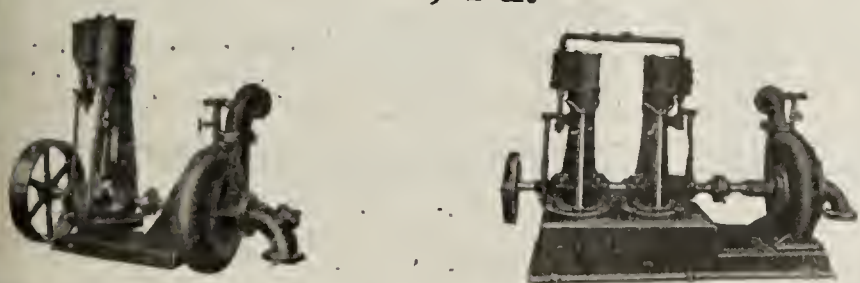
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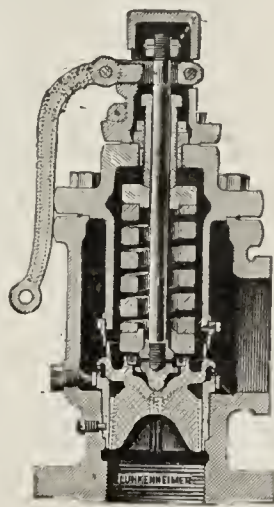
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Successors to the Erie Pump and Engine Works
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more than the excess pressure on a boiler is wasteful and expensive.



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will promptly relieve the over-pressure only, and no more.

The improved construction permits of very close regulation, and the amount of "pop" and the pressure setting can be adjusted from the outside without taking the valve apart.

They will not stick, chatter or hammer; are positive in action and will give long and satisfactory service.

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For CLINKER, LIMESTONE and COAL
THE LARGEST PRELIMINARY GRINDER BUILT

CAPACITY PER HOUR ON CLINKER					
80 TO 120 BBLs.	TO 20 MESH	WITH 80	— 90	H. P.	
50 "	80 "	" 40 "	" 80	— 90	H. P.
50 "	60 "	" 80 "	" 80	— 90	H. P.

UPKEEP APPROX. 10c. PER BBL.

The Ring-Roll Tube Mill Unit can produce cheaper cement from every standpoint — upkeep capacity, low power and continuous operation than any other. Ask the users, they can prove it to you, and we can.

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Superior Jaw Crushers

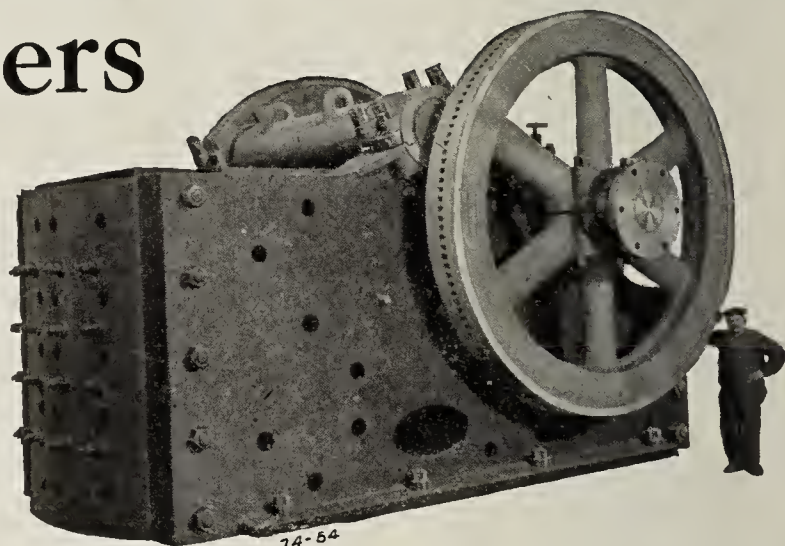
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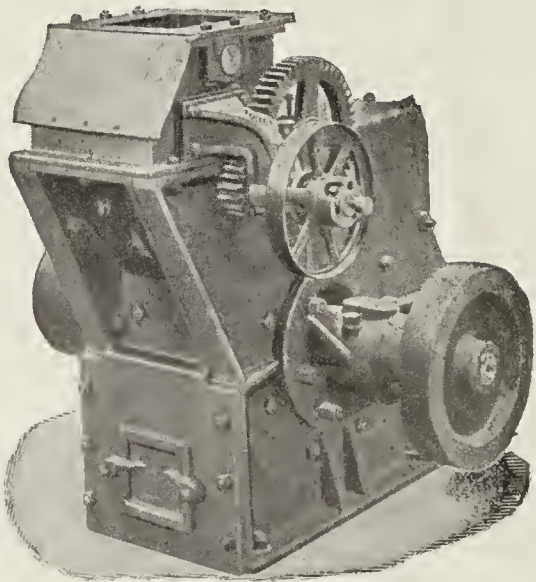
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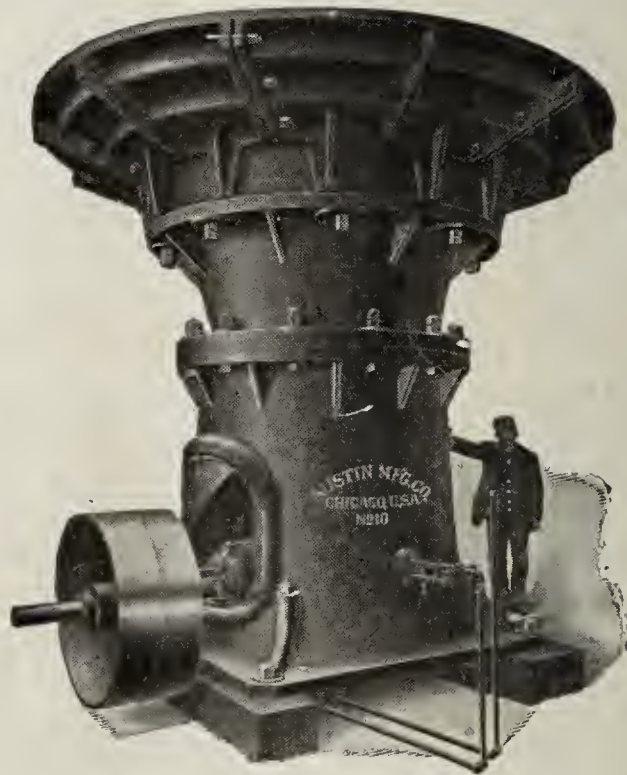
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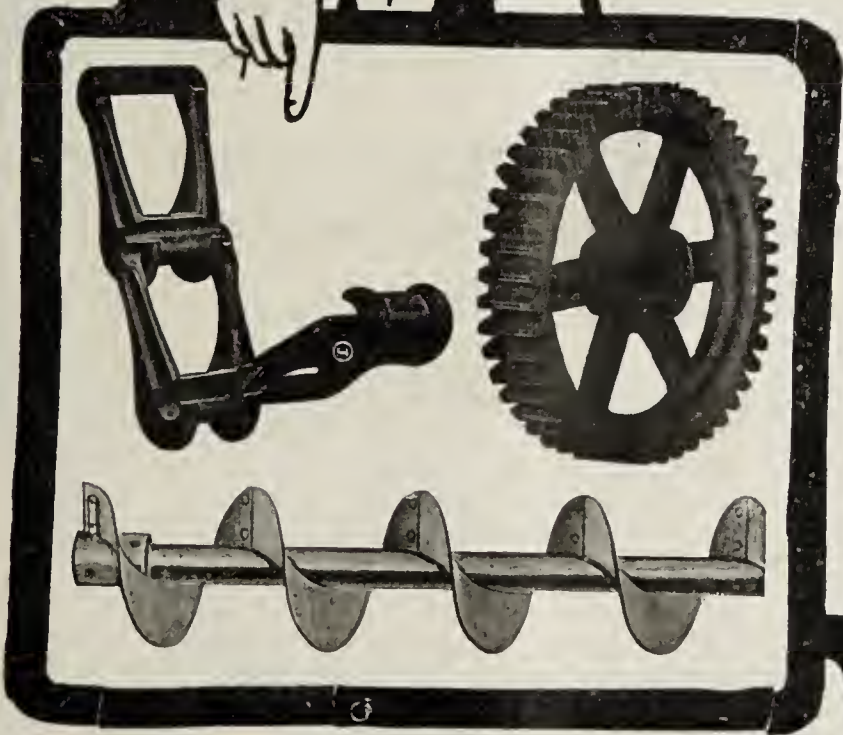


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FOR HANDLING SAND, DIRT, GRAVEL, CRUSHED STONE, ETC.

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This apparatus can dig anything a steam shovel will dig, and

its range is from the base of the derrick to the end of the boom and below the base of the derrick the length of the dipper arm.



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"VALVE BAGS"

THEY ARE THE BEST
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SAVE MONEY AND TIME BY USING THEM

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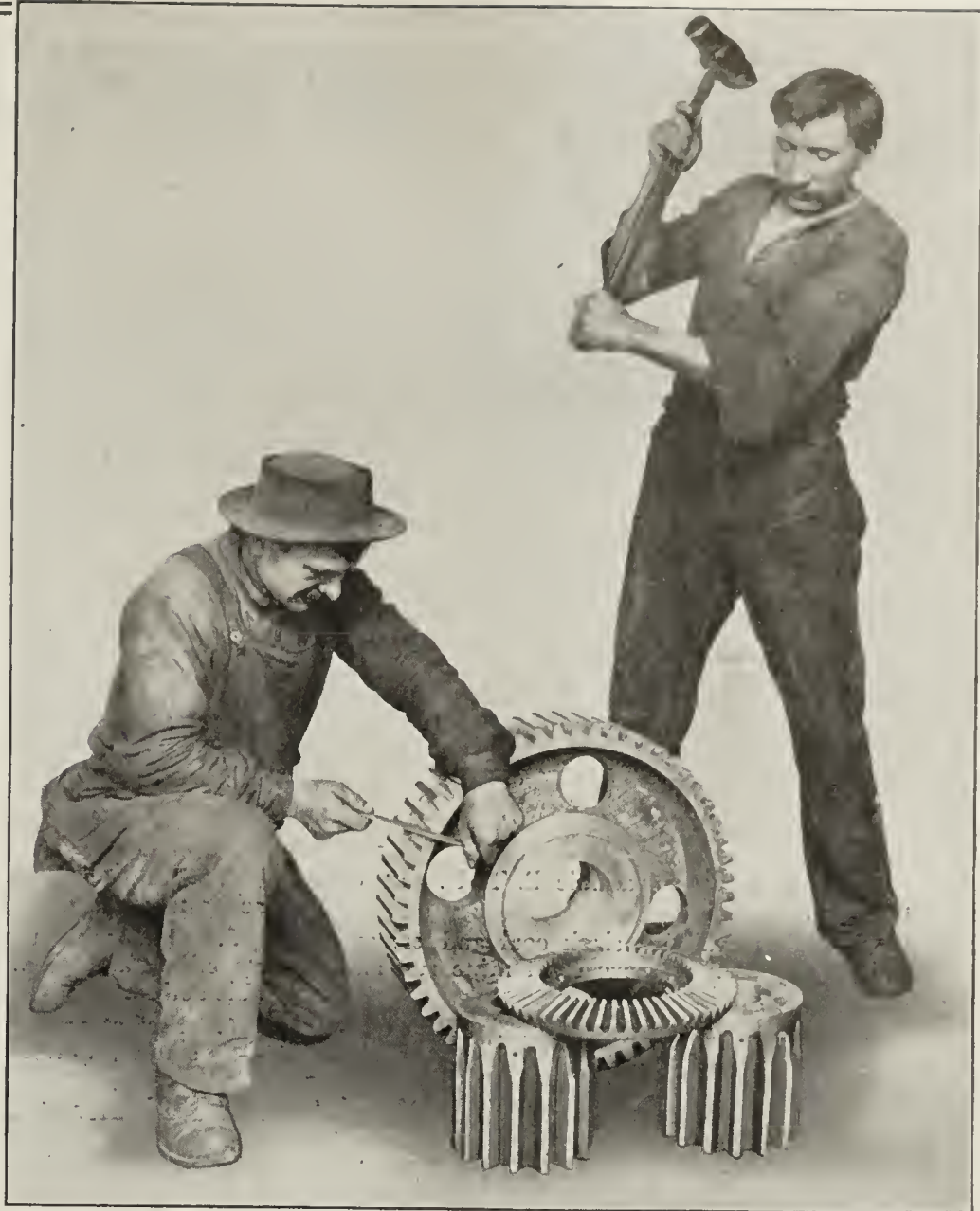
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Manufacturers of
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Increases THREE TIMES the life of gears, pinions, couplings, spindles, shafts, forgings and heavy duty parts of all kinds.

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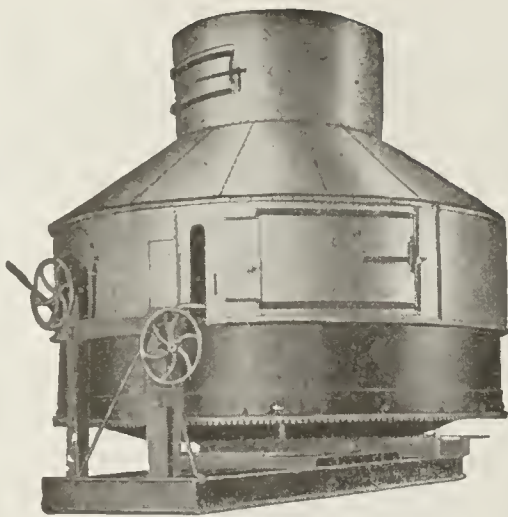
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IT does not take a "master mind" to install a CLYDE Hydrating plant, nor does it take a "high priced" engineer to run one. If **YOU**, Mr. Lime Manufacturer, realized how simple it is to obtain a PERFECT HYDRATE, with the CLYDE HYDRATOR you would place your order with us by FIRST MAIL. Write us today—NOW, and let us explain to you what CLYDE PROCESS hydrated lime is and how to obtain the best results, then

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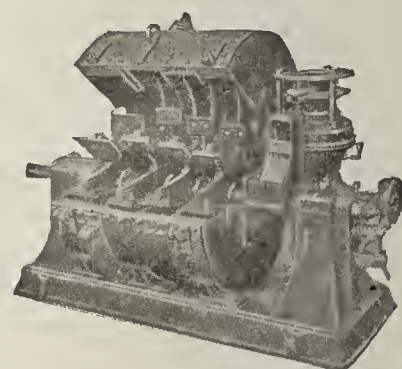
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BECAUSE

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Everything in Cut Gears

We have the largest plant in the West, equipped with the latest improved tools. Quick deliveries, low prices and first-class work our motto.

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Cut Cement Mill Gears

We are especially well equipped to furnish Cut Cement Mill Gears that make reliable and continuous service possible. Furnished any size for any requirement.

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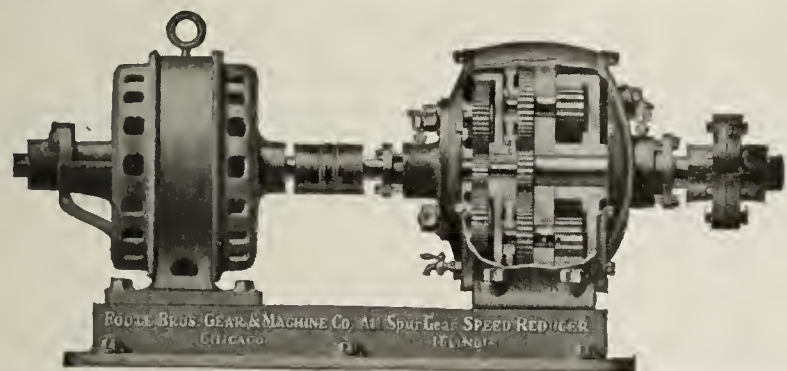
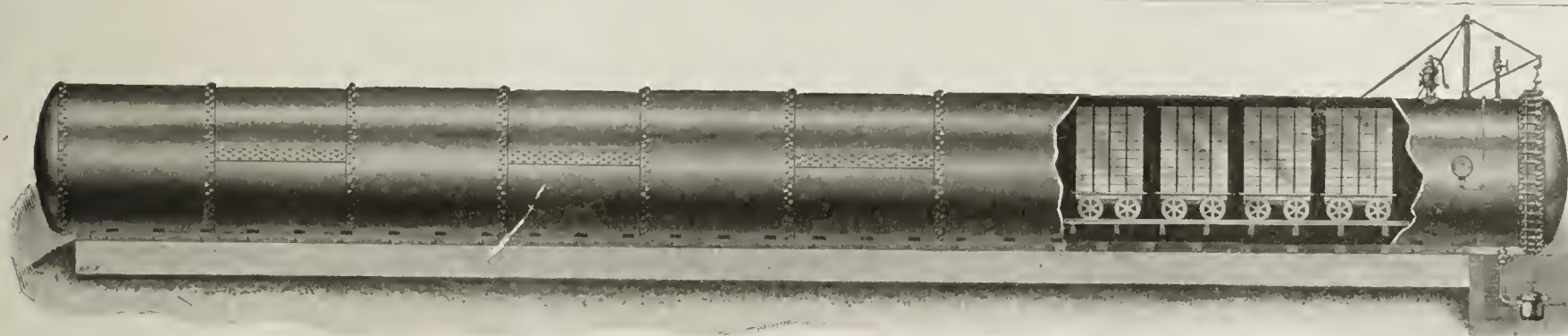
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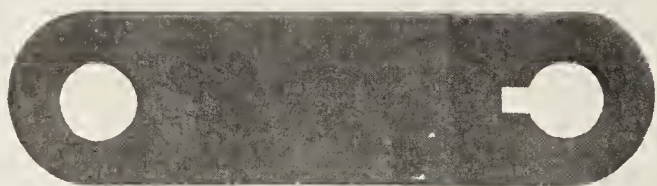
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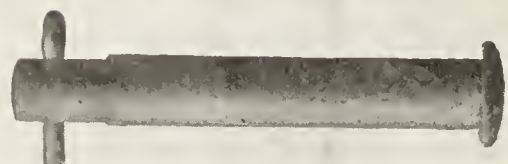
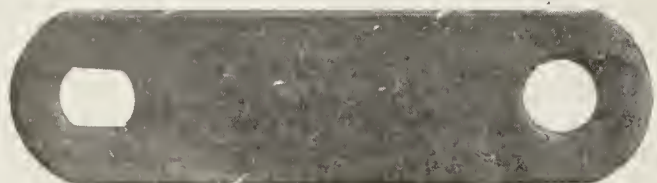
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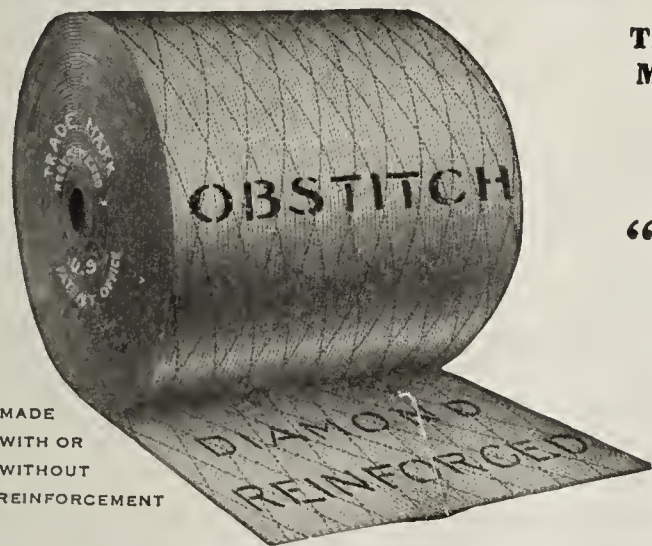
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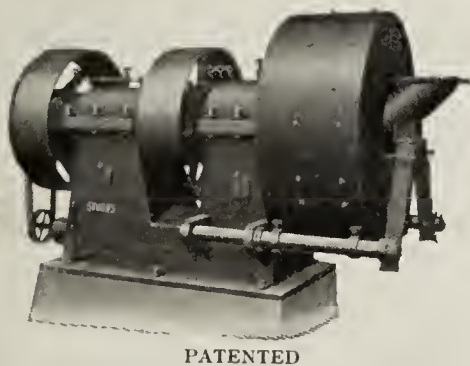
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Why It Should and How It Can Be
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CONTENTS

Collecting of Dust from:

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Coal Dryers

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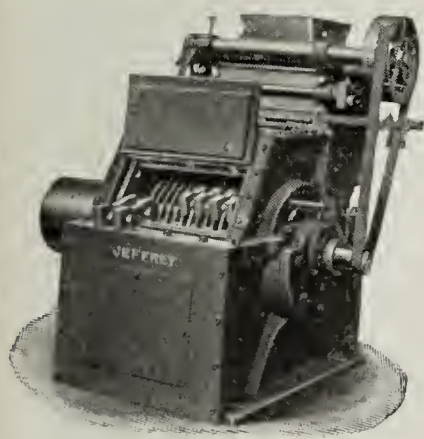
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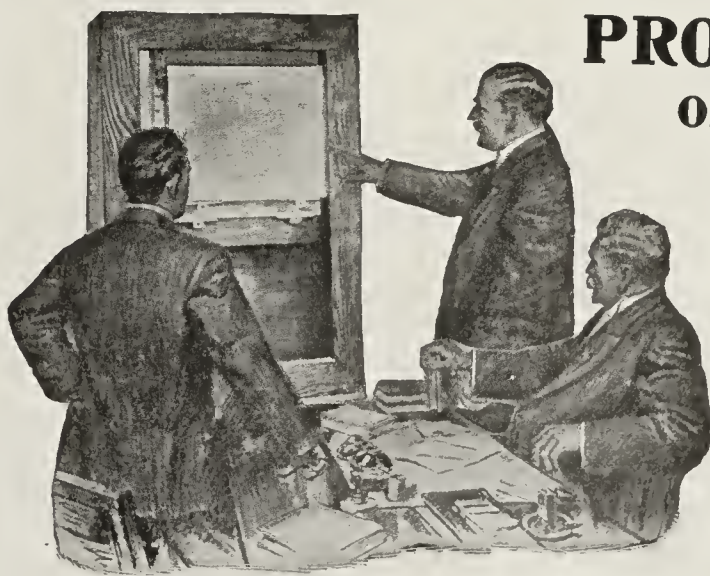
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CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

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JOHN F. WALDRON

Advertising Manager

CHICAGO, MARCH, 1915

THE COMMERCIAL VALUE OF THE CEMENT
SHOW

The fact that all available space at the Cement Show is engaged a year in advance illustrates sufficiently what importance the manufacturers of concrete machinery or of cement products attach to these yearly opportunities to exhibit their goods to a large public. Many of the exhibitors live in small towns and reach the public only through their advertisements in technical journals. A party interested in the manufacturer's catalogue, however, will not immediately take a trip to the factory in order to see the machine or process described. Here, at the Cement Show, the contractor, engineer or architect, have an opportunity to see a hundred manufacturers' products and machines at the same time and, hence, gladly take the time to come to town from the surrounding country in order to view the last year's progress in the art. A comparison of the various exhibits soon ends in the selection of the machine or process most suited to the visitor's needs and in a week's time the public have filled their wants and the exhibitors have booked orders that will keep their factories running for many months to come.

But, not only the manufacturer of a special line of machinery or owner of a certain process of making artificial tile, blocks, ornaments or similar goods profits by the Cement Show. Every cement manufacturer, who is on the grounds and contributes through his educational campaign towards the proper uses of cement, benefits by it and is sure to receive large orders from many of the thousands of visitors who will not forget to connect his name with certain advice received from him.

CONCRETE PIPE MEN GATHER FOR CON-
VENTION IN CHICAGO.

The American Concrete Pipe Association held its annual meeting in Chicago, February 15 and 16. Among the papers presented were "Concrete Sewer Pipe," by Lewis R. Ferguson, assistant secretary of the Association of American Portland Cement Manufacturers, and "Use of Bulk Cement in Concrete Products Plants," by P. W. King.

ROCK-CRUSHING PLANT OF THE NATIONAL
LIMESTONE COMPANY

One of the characteristics of modern engineering methods appears in the increasing magnitude, both of operations and of the mechanism by means of which they are conducted. Things have to be done on a wholesale scale to be done effectively, viewed from a commercial standpoint, and engineers and inventors have been obliged continually to increase the dimensions and capacity of apparatus.

Formerly the operation of rock crushing was limited, so far as machinery was concerned, to the breaking up of pieces of moderate dimensions to smaller sizes, and the handling of the larger pieces formed a part of the operation of quarrying. At the present time the demands of industry have changed this state of affairs, and today crushing rolls are in operation which are capable of handling pieces originally weighing as much as fifteen tons, such blocks being reduced to pass a $\frac{3}{4}$ -inch screen or finer.

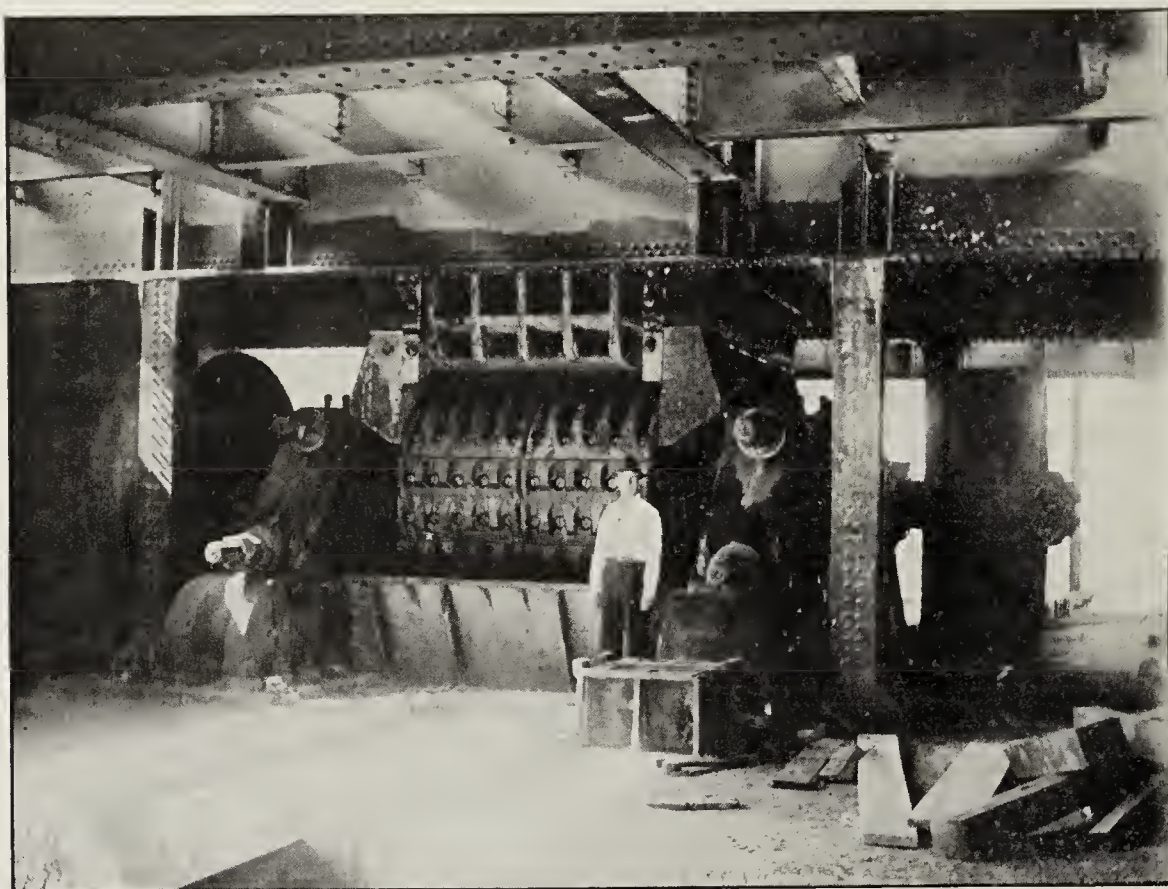
An interesting installation of such powerful crushing apparatus appears in connection with the production of pure crushed limestone, in connection with the manufacture of basic steel. The annual production of open-hearth steel in the United States has now reached a point of parity with that of Bessemer steel, and in the production of high quality of basic steel it is necessary to use limestone which is free from silica. It is most desirable to provide this limestone with economy, especially if considerable railway hauls are involved, and it has thus followed that the methods of crushing and screening developed by Thomas Edison become of interest, because of their high degree of efficiency.

In the Martinsburg, W. Va., district are located enormous deposits of very fine limestone. Everywhere it outcrops on the surface. In fact, the presence of limestone is a valuable agricultural feature. For a considerable number of years limestone has been quarried close to the city, if not within its actual limits. A great deal of the rock is highly tilted, so that the mining operations consist largely in the removal of the overlying soil or useless rock and a breaking up of the limestone by blasting operations. The property of the National Limestone Company of Martinsburg, W. Va., consists of about 1,000 acres, upon which are located four deposits. The one which is now being worked is two miles long and upwards of 150 feet deep. Its width averages about 200 or 250 feet. The stripping preparatory to quarrying the limestone is a very simple matter, consisting merely in the removal by hand methods of a thin layer of soil. The strata stand almost vertical. The edges are much eroded and soon become whitened upon exposure; so that a stripped area presents an appearance not unlike to a mass of monster bones. The irregularity of the upper face of the limestone thus precludes the use of machine methods of stripping. The mining consists in throwing down sections of an approximately vertical wall. This is accomplished by drilling vertical holes back from the face and blasting down the wall in front of the holes. Keystone Big Blast Hole churn drill is employed, a gasoline engine supplying the power. The entire drill rod, including the bit, will weigh about 1,100 pounds. The Keystone drill is made in Beaver Falls, Pa., by the Keystone Drill Company. Advance in the rock is made by lifting, turning and dropping the drill. The hole made is 6 inches in diameter. A row of such holes will be put down at a distance of, say, 25 feet back of the face of the quarry, and at intervals of about 20 feet. The depth will be perhaps 160 feet. The blasting is accomplished in two operations. First, about 75 pounds of 50 per cent dynamite will be exploded at the bottom of the hole for the

sole purpose of creating a cavity of some size. About half a ton of DuPont dynamite will now be put in, filling the cavity and reaching up into the undamaged part of the hole. The bottom half of the dynamite will be of the 50 per cent strength, say; and the upper half of the 30 per cent. When this charge is exploded, the effect will be to throw the lower portion of the wall out onto the floor of the quarry and permit the sheltered but not displaced upper portion to settle down into the position formerly occupied by the lower portion. This system of blasting can perhaps be used to advantage generally wherever a vertical wall is to be thrown down. It is probably of especial advantage at Martinsburg because of the fact that the strata are there highly tilted. Of course, the foregoing details as to depths and position of holes, and sizes and strength of charges, are to be regarded as merely typical.

ance from water. That confidence is not misplaced is indicated by the experience with the pump which has been installed for some time. The manager of the works reports that this pump has undergone hard service, has handled a large amount of water with ease, has been used day and night for over a year, and has cost far less than \$10 for repairs in that time. The second pump has been installed only recently and has hardly had time as yet to make its record.

The rock, when loaded onto special skip cars—one skip to a truck—is drawn by locomotives, made by Vulcan Iron Works, Wilkes-Barre, Pa., to its destination in the crusher house. Including the switches connecting with the Baltimore & Ohio R. R., the railway trackage on the property amounts to 4 or 5 miles. A train for the crushing rolls will consist of perhaps 10 or 15 cars. One of the three locomotives will draw the train into such position that the rear car is right along-



View of the Crushing Rolls, with a Portion of the Casing Removed, in the Plant of the National Limestone Company.

At Martinsburg a 100-ton Bucyrus steam shovel is employed to handle the product of the blasting and to load it onto special skip cars. Steel skips are also employed. A very important consideration with the methods used at Martinsburg consists in this. If a stone is not too large for the monster shovel, it will not be too large for the crushing apparatus. That is to say, any secondary blasting of particular blocks has primarily the capacity of the shovel in view. Another big shovel is to be put to work later on. A little consideration will show that the use of the largest size of shovel combined with the capability of the crushing apparatus to take anything handled by such shovels leads to very considerable economies. The blasting expense is greatly reduced, and also the cost of labor. A further and considerable advantage arises from the increased independence of labor conditions.

In connection with the efficient working of quarries such as those in Martinsburg, it is quite important that the arrangements for drainage be thoroughly dependable. From the point of view of economy, it is also desirable that the necessary pumping apparatus be simple and subject to the necessity of only infrequent and small repairs. At these quarries are installed two standard pumps. Upon these two pumps alone the management depends for the necessary clear-

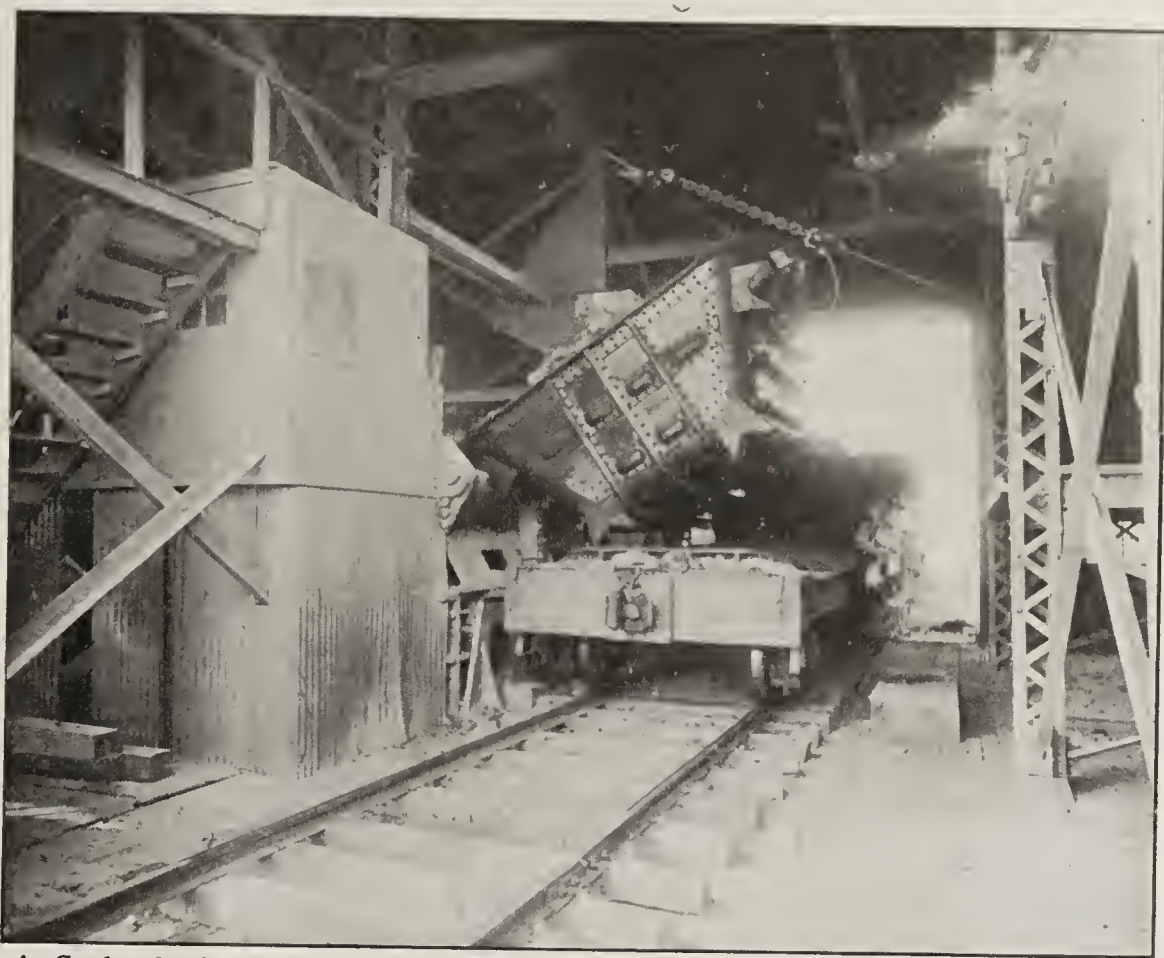
side the hopper which leads to the rolls. When this car has been dumped, the train will be shifted to bring the next car into position, and so on. Because of the character and capacity of the crushing arrangements, no especial care is necessary in connection with the dumping of the skips. The load is simply dumped into the hopper, whether it consists of one or two enormous blocks or a mixture of big and little stones. Just over the rolls, a horizontal section of the opening of the hopper is a rectangle of about 7 by 10 feet.

The Crushing Rolls

The actual crushing is done by a pair of enormous rolls. Each is 6 feet in diameter and 7 feet long. Their cylindrical surfaces are provided with numerous projections or knobs arranged in circumferential and longitudinal lines. All knobs are essentially alike with the exception of those in two longitudinal rows on one of the rolls. The great majority are about 2 inches in height. A circumferential row is in reality an annular rib interrupted here and there. As the rolls are given a rotational movement, the knobs have front and rear faces. These are planes inclined towards each other above. Thus, the forward face is a plane extending upward and backward. The inclination to the cylindrical surface is not a steep one. The other knobs, arranged as already said in two longitudinal

rows, are of superior height. Their forward faces are quite steep. These knobs, arranged in two lines diametrically opposite each other, are known as "sluggers." They are prominent, if not the chief, agents in shattering the rock. The two rolls are placed alongside each other. Their circumferential rows are immediately opposite each other. That is, the arrangement is not a staggered one. When in operation the rolls rotate in opposite directions—towards each other, viewed from above. There is thus produced a kind of V-shaped trough, the sides of which are in rapid motion towards the bottom. When running at full speed with no charge of rock between them, the rolls have an angular speed of about 165 rotations per minute. As the roots of the knobs are 3 feet from the axis of rotation, they have a velocity of about 35 miles per hour. At any given point where sluggers pass,

such plates make up the complement belonging to one roll. The number of bolts to a roll is thus 160. All tap bolts have a diameter of 2 inches, except those which secure the slugger plates. These latter tap bolts have a diameter of $2\frac{1}{2}$ inches. All threads are V-shaped. No nuts are employed; the bolts are simply screwed into tapped holes in the mandrel. The plates are of chilled cast iron; the mandrel is of cast iron. The great shaft is reduced to 18 inches diameter at the bearings. The two shafts may be adjusted at various distances apart so as to crush the rock to different predetermined sizes. When brought to the minimum distance apart, the product of the crushing operation will be sizes ranging from about 4 inches down. In this position the sluggers barely clear the knobs of the companion roll. The rolls may be placed as far apart as 8 feet 8 inches between centers. The

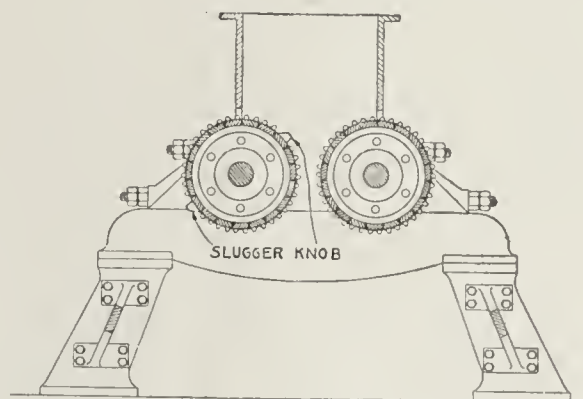


A Carload of Limestone Rock Being Dumped Into the Hopper of the Crushing Rolls.

330 blows are delivered per minute—or $5\frac{1}{2}$ blows per second. As there are 8 or 10 sluggers arranged in a longitudinal row, it will readily be seen that we have here the equivalent of a numerous body of violently active sledge hammers. Furthermore, the sluggers and other knobs operate with the accumulated energy of the heavy rotating weight of the rolls. They weigh, in fact, about 50 tons each. The shattering effect is incredible. It matters but little what is the size of the rock. If it is once fairly in the grip of the rolls, it will be smashed to bits in a few seconds. A large skip load consisting of big and little stones will be so effectively and so quickly smashed to pieces—chewed up, as it were—that one gets the impression that the stones have no chance.

The crushing rolls are an invention of Mr. Thomas A. Edison. Each roll rotates with a shaft 21 inches in diameter passed through it. Next to the shaft is a mandrel having an octagonal cross-section. Upon the plane rectangular surfaces thus supplied, the crusher plates themselves are secured by large tap bolts. Ten bolts hold each plate. The plates themselves are $22\frac{1}{2}$ inches broad at the bottom and $3\frac{1}{2}$ feet long. The maximum thickness, exclusive of knobs, is 5 inches; the minimum 4 inches. Sixteen

product will then be approximately 24-inch and smaller. Six-foot giant rolls readily take care of stones weighing 15 or more tons. In fact, they are able to deal with cubes 7 feet on a side and weighing 28 tons. It will thus be seen that such large crushers



Section of Crushing Rolls.

as the giant rolls at Martinsburg have a capacity well up to, if not beyond, that of the largest of the steam shovels. The energy of such a pair of rolls rotating at 165 revolutions per minute is estimated in effect at about 4,000,000 foot-pounds. It is important to

have this accumulated energy available. When the rock is fairly gripped, both rolls tend to rotate in unison. Because of the enormous amount of work done in such a short time, the rotative speed goes down sharply and then slowly recovers itself. The shattering of an 8-ton rock will require perhaps 13 seconds from start to finish. Ten seconds of this time may be required to regain speed. The two rolls are not geared together, but are operated absolutely independently of each other by separate motors. It is supposed that the slugger roll does the greater portion of the work. Probably in the majority of the cases its speed falls off more than that of its companion. However, they keep pretty well together. The motors fall off somewhat in speed, probably, but the reduction in rotation velocity of the rolls is far beyond what can be accounted for thus. The driving pulleys slip in the belts which envelop them. Considering this slippage, one will not be surprised to learn that the upkeep of belts is one of the chief items of maintenance. The total expense for upkeep is, however, quite moderate. I do not have figures for the plant at Martinsburg, but referring to figures covering the operation of four rolls at the works of the Edison Portland Cement Company, some interesting facts come to light. In the space of two years these rolls crushed rock from sizes running up to 10 tons to a size capable of passing a $\frac{3}{4}$ -inch perforation. The entire amount thus crushed amounted to 1,024,409 tons. Exclusive of labor, the repairs and replacements cost \$8,718.39—an average of \$0.0085 per ton. The plate expense accounted for about one-half; the belt expense for about one-quarter.

At the Martinsburg plant the giant rolls are driven by a pair of electric motors, each having a power capacity of 200 horsepower. When it is understood that the energy demanded at the most intense instant may arise as high as 3,000 or 4,000 horsepower, it will be seen that it is very necessary to store up energy in the rolls—just as with the ordinary fly wheel. The maximum demand continues, however, for a very short interval—perhaps half a second. Remembering that at this moment the rotational speed has been considerably reduced, we are prepared to learn that the crisis of the crushing operation is accomplished by one or perhaps two blows of the slugger knobs. Immediately before and after the single blow of a row of sluggers the demand for energy is much less. The belts which connect motors and driving pulleys are 24 inches in width. The motor pulleys are 32 inches in diameter and those on the rolls 96 inches, so that there is a speed reduction in the ratio of 3 to 1. As the rolls are operated in opposite directions, the upper side of one belt and the lower side of the other are tight. One belt has, then, a slack lower side. An idle roll is used to support this. The roll pulleys are mounted directly on the roll shafts, one on either side of the crusher. The successful use of electricity for this service is ample proof of its adaptability for work where shocks are to be expected and taken care of. A satisfactory solution of such problems is ordinarily or often to be sought in the use of apparatus having fly-wheel characteristics. These rolls are successfully driven by motors totaling only 400 horsepower because of the great weight and substantial character of the rotating mechanism. It is doubtful whether the shocks of a rolling mill are proportionately equal to those experienced with these rolls. The demand for energy at the moment of crisis may be 8 or 9 times the capacity of the driving engines.

What the capacity of such rolls as those at Martinsburg actually is no one probably knows. It is far beyond the capacity of the remainder of the plant. In fact, the output of the whole works is determined

by the capacity of the conveying arrangements which transport the product of the giant rolls to the summit of the screen house. At present this capacity is about 1,000 tons per hour. It is probable that the capacity of the rolls is several times this.

The present practice at the Martinsburg plant is to use the rolls for crushing to a size at least as small as 7 or 8 inches. There will, of course, be quantities of rock of all sizes below, including dust. It is all valuable, provided it is properly classified. So then, the problem subsequent to the great crushers is largely one of screening. But not altogether. If a very considerable percentage of the smaller sizes is desired, then supplementary crushing will be employed as part of the procedure. Crushers may be employed on this service. At Martinsburg the giant rolls are the only crushing apparatus at present in use. Consequently, the smallest sizes are produced in relatively small amounts. That is to say, the product is now largely confined to the sizes used in the open-hearth process of steel making and the blast furnace production of pig iron. To these may be added the sizes used for railway ballast, road making, etc. It is proposed ultimately that this plant shall include additional rolls and screening apparatus in order to produce considerable amounts of the smallest sizes. These sizes are employed in the manufacture of glass and agricultural fertilizer.

The screening apparatus now in use and projected are all stationary devices. No perforated plate rotates or shakes. This system provides a series of inclined perforated sheets arranged at intervals vertically. The rock falls through these by the simple force of gravity. In order to secure the amount of screening desired, quite a number of plates are necessary. In consequence, the screen house is a tall affair. Power economy is secured, because of the simplicity of the movements required. Thus, for example, the rock which comes from the giant rolls is transported in bulk to the top of the first screen house—the only one now built. This operation, if we except that required for a short line of conveyor, represents the total power requirement of all the screening now taking place at this plant. That is to say, a single lift of the material in bulk effects the screening.

When the rock comes from the giant rolls it falls into a hopper, delivery from which is controlled by a smooth roll driven by power whenever it is desired to discharge rock. An inclined railway runs from a point beneath the discharge opening to the top of the crusher house near by. There are two tracks for the greater portion of the incline. Both tracks merge, however, below the discharge point mentioned. Two large steel skips are hoisted and lowered by means of double cables running over sheaves arranged above the summit of the incline and descending to a duplex winding drum located at the ordinary level. One skip descends empty while the other ascends under load. Eighteen, or perhaps twenty, tons of rock can be carried at once. The rear axles of the skip cars are provided with an additional exterior wheel on each side. These run on a short length of track arranged at the top of the incline, and forming in effect a continuation of the main track. The track of normal gauge, however, makes a turn in a vertical plane. The effect of these arrangements is that the rear axle continues on up the incline, while the front axle turns off. In consequence, the skip is dumped over its forward end. The screening operation from a lower point of view is now complete. Gravitation—overcome in the hoisting—supplies the movement necessary. The holes in the screen are oblong, the principal diameter being in the general direction of fall.

As the rock slides on the screens and falls through, the various sizes are segregated and diverted. It is expected ultimately to perform a supplementary screening operation in a second screen house whereby certain sizes will be rather minutely divided into sub-grades. Two lines of belt conveyor are to be added—one will carry rock from the basement of the first screen house to the top of the second; the other will return over-sizes to be crushed in secondary rolls. In the second screen house gravitation will again supply the moving force to carry the rock over the screens.

The screen house has a total height of about 108 feet above the surface. There are, in all, seven floors, the longest distance between floors being 22 feet from the sixth to the seventh floor levels. The portion containing the lower floors has a much larger plan area than the higher part. The skip hoists are carried on trusses from the hopper pit under the rolls up to and into the tower-like portion of the crushing house. The lower structure has a plan area of about 40 x 47 feet; above, the plan area is about 22 x 38 feet. When it is considered that exclusive of the car there is a concentrated moving load of about 18 tons to be provided for on the incline and on the horizontal at a considerable elevation, it will be seen that the requirements for strength are severe. Further, the practice of suddenly dumping the load of rock and letting it drop down through the various stationary screens imposes the necessity of resistance to shock and vibration.

By using supplementary Edison rolls it is quite possible to crush rock so that there will be little or nothing larger than the $\frac{3}{4}$ -inch size. This has been proved at the works of the Edison Portland Cement Company, as has already been explained. It will readily be seen, then, that these machines are competent to the breaking up of ores and the like. The ore or other product of the mine can be fed to giant 6-foot rolls in blocks as large as the biggest steam shovels handle. The product of these rolls can then be passed through supplementary crushers of the same general type, the result being material much of which is very fine and none of which is larger than the $\frac{3}{4}$ -inch size. The economy in blasting expense must be of a high character where the product of the primary blasting needs reduction only to steam shovel capacity. The considerable elimination of dependence upon unskilled labor thus accomplished is likewise important.

BIG BLAST HOLE WORK.

In reply to your letter in regard to the economy in the use of big blast hole drilling in ledges not exceeding 20 feet, we beg to state that we are constantly using the well drills where the holes are 20 feet and under, and even 10 feet and under. In cases of very hard rock, such as trap rock, the shorter holes mentioned above are probably not as economical with a well driller as with a steam drill, but with the soft rock we use the well driller with economy on anything 10 feet and over; providing, of course, the holes are all down holes and the machine can be readily moved over the ground. The superiority of the Big Blast Hole driller for blast hole work, in our opinion, is not fully appreciated. We are working our well driller in places and on jobs where a year or two ago we would have thought out of the question. In fact, any job that we can move our well driller on we do so. Yours truly, Richards & Gaston, 143 Liberty street, New York.

PULVERIZING LIMESTONE

The pulverizing of limestone for agricultural purposes is coming into favor very rapidly and we are called upon to supply mills for this purpose and we believe it would be to the interest of your readers to know that we have a mill which will pulverize to the necessary fineness and has a larger output and runs on a lower maintenance cost than any other mill or combination of mills ever used for this purpose, write the Bradley Pulverizer Co., Boston. We are today in receipt of a letter from the Medina Lime Co., Medina, N. Y., in which they state as follows:

"Would say in regard to the machine in question (which is your BRADLEY THREE ROLL MILL) that it has done fully what you people claimed for it." In fact in this particular instance we might state that the mill in question did more than we claimed for it as we guaranteed an output of 5 tons per hour to a product which would run 90% through a 60 mesh sieve and these people are obtaining an output much more than this to a fineness of 61% passing a 200 mesh sieve, 90% passing a 100 mesh and all of the material passing a 25 mesh sieve. This we maintain is the largest output of fine material ever produced by a pulverizer that requires less than 50 H. P. to operate.

The Medina Lime Co. make a specialty of fine pulverized material and advertise that their lime is the finest ground. This is only one instance where the BRADLEY THREE ROLL MILL has satisfied the operator as to fineness. Most every other company using this mill for pulverizing limestone has found that it is the most economical mill that can be used for this purpose. We believe that your readers will be very much interested in knowing that a mill of this character can be obtained at a reasonable price. It has an output of from 5 to 8 tons per hour, taking material $\frac{3}{4}$ " and under in size and reducing it to the necessary fineness without the use of auxiliary screens. This simplifies machinery, minimizes the amount of power and surely is the mill that all large producers of limestone should use.

USE OF HYDRATED LIME IN DAM CONSTRUCTION

In building the Condit dam on the White Salmon River in Washington, 10 per cent by weight of the cement of the 1:3:5 mixture was replaced by hydrated lime. Before the lime was adopted laboratory experiments were made on briquettes to ascertain whether the strength was in any way decreased. These tests showed that such briquettes compared favorably both with briquettes made of lime and sand and those made of cement and sand. The concrete mixture used on the job was "fat, greasy and plastic," and flowed smoothly through comparatively flat chutes without separation of the mixture. The cost of the hydrated lime was slightly in excess of that of the cement replaced, but it is stated that this extra cost was made up for by the greater ease in placing.

FREIGHT RATES ON SAND.

The Yough Sand and Stone Company, Dunbar, Pa., with an operating plant at Friend Station, on the Connellsville and State Line Railway, has filed with the Public Service Commission a complaint against the Connellsville and State Line, Western Maryland, Pittsburgh and Lake Erie, Baltimore and Ohio, and the Pennsylvania railroads, alleging discrimination in the transportation rates in favor of competitors at Dunbar of from twenty to thirty cents a ton, depending upon the equipment in which the sand is loaded.

CONCRETE GAS TANK WATERPROOFED WITH HYDRATED LIME

Messrs. Lucius E. Allen, C. E., of Belleville, Ont., and Edward B. Merrill, C. E., of Toronto, Ont., early last spring undertook the reconstruction of a gas holder for the municipality of the city of Kingston, Ont. The job was originally put in more than two years ago, and was very unsatisfactory, and well nigh a total failure, on account of the leakage, which continued to grow apace, so that the holder had to be finally abandoned, as it was no longer able to hold the water. This tank was built originally in the summer of 1907, having a capacity of 150,000 cubic feet, and it is approximately sixty-eight feet in diameter by twenty-five feet in depth.

The specifications called for a circular concrete wall of about 24-inch thickness to the ground level. This concrete wall was laid by a local contractor, and was given a heavy coat of coal tar and resin, which was allowed to soak in before the tank was filled with water. In the fall of 1907, after the wall was alleged to have seasoned, the water was turned in and immediate leakage of about 23,000 gallons per day ensued. This necessitated a large, continuous supply of water into the tank and was extremely expensive, and early in the spring of 1908 the city commissioners decided to suspend the use of the holder and have an examination made. The examination disclosed that the concrete had been poorly proportioned, the mixing had been insufficient and apparently no care had been used in selecting or grading of the aggregate materials. It was then decided to apply tarred felt to the original wall, and arrangements were made to conduct experiment No. 1 in waterproofing the tank. This was done by applying three layers of tarred felt with a coating of No. 4 pitch between each layer, covered with a cap sheet, making a four-ply covering for both sides and bottom. In addition to this a four-inch layer of 1-2-4 concrete was laid all over the bottom. The tank was then placed in commission, and while the leakage was somewhat reduced, a four-inch stream of water from the city main was still necessary to keep the water up to the required level. As this was too expensive and somewhat dangerous on account of the tendency of the water to undermine the tank in places (in which case a 24-inch wall would not be strong enough to withstand the 24 feet head of water) it was decided to again take the tank out of commission and to either demolish the old substructure, or, if possible, reconstruct it so as to reduce the leakage to a minimum.

The city authorities early in May, 1909, again called for tenders for the reconstruction and waterproofing of the gas holder, and the contract was given to Messrs. Merrill and Allen, engineers of Toronto and Belleville, Ont., respectively.

The vertical wall was then chipped back from three to six inches by means of pneumatic chisels and hand-drills and the old concrete surface systematically roughened and cleaned so as to secure the thorough adhesion of the new concrete. Special forms made on the principle of the stage or bridge used in theaters were made and the work of laying concrete was carried on continuously so far as possible, a complete ring being placed continuously.

The wall is now composed of a 3-inch thoroughly waterproofed concrete, proportioned 1-2-4 with about 18 per cent of the weight of cement of Hydrated Lime added to the mass at the time of mixing. The materials used were Lehigh Portland Cement, clean and well graded lake sand, crushed limestone and Hydrated Lime. Special precautions were taken to insure thorough tamping of concrete, and the mixture was made sufficiently wet to flow freely.

Within three months from the time the work commenced the tank was again placed in commission and frequent tests have since been made by the city engineering department, which show a maximum leakage of under ten gallons of water in 24 hours, which may be accounted for by evaporation or absorption.

The holder, having now been in constant use for about 15 months, is considered satisfactory from every standpoint, and the improvement is permanently completed.

The following excerpt from Mr. Allen's letter throws further light on the subject: "In reference to your inquiry as to the amount of Hydrate used in the Kingston job, would say that we used approximately 18 per cent by weight of the cement, and not of the aggregate. In the writer's opinion a larger percentage of Hydrate could have been safely used, although in this case we did not have to exceed a four-inch layer



Complete Wall Lining of Gas Holder.

of concrete to place, and therefore we required a very strong concrete. Another strong feature of this particular work was the fact that the addition of the Hydrate increased the adhesiveness of the concrete, so that we obtained an exceptionally good bond between the old concrete wall surface and the new concrete. In a wall of say 12 to 18 inches I would certainly use a larger percentage of Hydrate, up to 30 per cent by weight of the Cement."

TILE DRAINAGE

Tile drainage is receiving much attention at this time from the farmers' institutes and the farmers' publications which circulate in this territory and the Federal Government has acknowledged the demand for expert assistance by sending a drainage engineer to Louisville to assist the local force. D. F. Culbertson, assistant engineer in the Department of Agriculture's drainage bureau, has arrived in Louisville to work with F. Shafer, expert drainage engineer, and to assist him in plans for laying out tile and other drains in this part of the country. For the present Mr. Culbertson will be assigned to projects in the western part of the state and later will be engaged in Jefferson county.

CONCRETE AND REINFORCED CONCRETE IN 1914

By Sanford E. Thompson,
Consulting Engineer, Boston.

The year 1914 has been remarkable for the small number of private enterprises undertaken, not only in concrete but in all lines of construction. On the other hand, a number of large and important pieces of work, many of them begun in previous years, have been carried on; in fact, the period is notable for the magnitude of many of the jobs. At the present time there is a prospect of a gradual improvement in conditions in structural lines during 1915.

As a structural material, concrete is at last taking a place where the matter of safety under load and durability under normal conditions is unquestioned, and the selection of reinforced concrete is dictated simply by comparative economy and adaptability to the given design.

The fireproofness of reinforced concrete has been put to a most severe test recently in the conflagration in the Edison factories at West Orange, N. J. The advance reports recently published in the Engineering Record indicate that while the effect of the terrible heat—a heat greater than any known structural material could resist—combined with the water has played havoc in certain parts even of the concrete buildings, the condition of these is remarkable in comparison with the tangled ruins of the adjacent brick and steel, and brick and wood structures. As a matter of fact repairs already are being made and it is proposed to remove only a small portion of two floors of one building. Several injured columns are being cut out and replaced, while others are being strengthened.

Important along investigational lines has been the search for more exact knowledge of the properties of the materials used in reinforced concrete and of the exact action of completed structures under load.

In the building end of the field we find the more up-to-date contractors introducing more systematic methods of management with a view to reducing costs and bettering workmanship. This has been along the lines of design of plant and also of more systematic planning of their work, standardizing methods and tools, and in certain cases paying the men an added wage for accomplishing their jobs in the time and by methods laid out in advance. In other words, the contractors are introducing methods of management that have already been applied so successfully in manufacturing plants.

Progress in these directions means better work at less cost with, as a consequence, an ever widening field for concrete.

Tests

The most notable series of tests of reinforced concrete brought out during the past year is that on bond between concrete and steel conducted at the University of Illinois by Duff A. Abrams. The theoretical and structural considerations in the design of flat-slab floors are attracting much attention and several series of tests are now in progress which undoubtedly will throw further light on this problem. In plain concrete the fundamental importance of which is frequently neglected because of the more interesting features of reinforced concrete, tests made by various universities under the direction of a committee of the American Concrete Institute have resulted in extremely valuable conclusions relating to the sizes of specimens to be employed in tests; the variation in crushing load due to the size and height of the specimen; and the effect of different ages, different percentages of water, and different methods of storage. A cylinder with a height double its diameter, preferably

6 in. in diameter by 12 in. long, or 8 in. in diameter by 16 in. long, is recommended. At the same time the comparative tests in compression of short cylinders and cubes at different ages give means for determining the approximate corrections for other sizes and ages which do not correspond exactly to the recommended dimensions.

In July last, at the convention of the American Society for Testing Materials, a new committee, Committee C-9, on Standard Tests of Concrete and Concrete Aggregates, was organized and is co-operating with the American Concrete Institute committee to develop still further the standardization of tests and the studies of aggregates. This committee has been split up into sub-committees (each comprising three or four men experienced in special lines), the work of which includes standard methods of tests for concrete and laws of mechanical mixtures; methods of sampling and testing field concrete; relative values of various strength tests; investigation of impurities affecting fine aggregates; standard methods of testing for voids, weights, density, specific gravity and consistency; methods of tests for coarse aggregates; and the gathering of data relative to available aggregates for concrete.

Concrete Roads

The difficulty in producing a satisfactory pavement to withstand both teaming and auto traffic has resulted, in many localities, in a resort to cement concrete. Some of this work has been experimental, while many sections of road of considerable length have been built. Engineers in charge of this class of work, as well as the contractors handling the jobs, are only just beginning to realize the absolute necessity of first-class materials as well as first-class workmanship. Many of the roads now under construction will ultimately fail and go to pieces under traffic, not because concrete as concrete is at fault, but because so many so-called practical constructors have not yet grown out of the belief, expressed to the writer several years ago by the chief engineer of a large railroad system, that "no cement is worth purchasing unless you can mix it up with mud dug out of the bed of a river and make good concrete."

The Conference on Concrete Road Building held in Chicago was a long step toward the standardization of methods and materials. The committee reports and rules for recommended practice have been issued in a 200-page volume, which is well worth the study of those interested in this branch of concrete work. The fundamental principles of practice recommended by the conference are: a clean and hard aggregate; coarse and well graded sand; rich mixture; careful proportioning; thorough mixture of materials; intelligent and thorough inspection; reinforcement in certain cases; special attention to sub-grade; a viscous plastic consistency of the concrete; and continuous protection from traffic for four weeks after laying, at the same time keeping the surface covered and moist.

Important Structures

In spite of business depression, much private work has been carried to completion and the number of comprehensive schemes of public improvements in progress has been unusually large. The comparative cheapness of concrete as a structural material and its adaptability to a great variety of conditions, have played an important part in aiding the development of engineering construction.

The most prominent piece of work for which large quantities of concrete have been used is, of course, the Panama Canal, and as a direct result of its opening are the various jobs of local importance undertaken in many of the coast ports of the country.

New England

In New England perhaps the most important job is the new plant of the Massachusetts Institute of Technology in Cambridge, where the buildings under construction would extend over 2,500 lineal feet if placed end to end. A number of industrial buildings of large size have been built, a few of them in the vicinity of Boston, others in central Massachusetts and central Connecticut. In Boston an 8,000-foot subway was opened to traffic in October, and work is rapidly progressing on two more subways. Under the directors of the Port of Boston considerable harbor work—a large dry dock, several large covered piers, and a bulkhead—is in hand. Elsewhere in New England the new Grand Trunk extension has recently completed a number of small and medium sized structures in connection with a great deal of bridge work. Providence has added a much needed subway to its transportation system. Fitchburg is using considerable concrete in its sewage disposal system, and on the Connecticut river important power development work is under way or recently completed.

Middle Atlantic States

In the Middle Atlantic states, New York City, as usual, has done much harbor work and considerable is planned for the future. The new subway system, however, is easily the most conspicuous piece of work in the city. On the Catskill water supply system and on the State Barge Canal much progress has been made. On the Kensico dam, of the former project, 65,290 cubic yards of concrete were placed during the month of May, a most remarkable record. This works out to 507 batches, two-yard batches per mixer per eight-hour day. Railroads usually attract less notice than public work, but the New York Connecting Railroad in the short distance of $3\frac{1}{2}$ miles is using over half a million cubic yards of concrete. The Baltimore & Ohio has erected a large warehouse in New York, while the 12-story building of the Larkin Company in Philadelphia is notable for its size and the up-to-date methods of construction. The railroads of Pennsylvania have made many improvements, including on Delaware, Lackawanna & Western, two viaducts, averaging 2,000 feet in length and a tunnel of over 3,500 feet, the three projects involving close to 400,000 cubic yards. In a six-mile extension, the Lake Erie & Western Railroad used over 100,000 yards in bridges and viaducts, and the Pennsylvania Railroad built two multiple-span concrete bridges of 2,500 and 5,000-foot length. The Central Railroad of New Jersey selected reinforced concrete for an up-to-date locomotive terminal. In Philadelphia there has been put up the largest grain elevator in the world, and a new system of subways is being planned. Baltimore's work in concrete includes a comprehensive sewerage system and a water supply system with a large dam, a 2,000-foot tunnel, and a mechanical filtration plant. Considerable harbor work is also under way. A long viaduct has been built and progress has been made on the subways. Much of the work carried on has been unusually difficult, and at the same time on a large scale.

Southern States

Many of the coast harbors of the South are undergoing improvements and many concrete piers are being built. A large hydroelectric plant has recently been put into service on the Coosa River, which will mean much to the industrial development in this section of the New South. The building of cotton storage warehouses, inaugurated before the beginning of the war, is an interesting recognition of the saving in fire insurance premiums and the advantage of permanent structures. Several large bridges and viaducts have been put up during the year, together with a

number of pieces of private work. One of the most important structures projected is the bridge over the Tennessee River at Chattanooga.

Middle Western States

Many cities in the Middle West are carrying out or planning large improvements, involving the use of concrete. Cincinnati, Milwaukee, Chicago and St. Louis are all at work on sewerage systems, Cleveland and St. Louis are building immense filtration plants, and Chicago a half million dollar tunnel. The new Soo Canal, with its locks, is one of the big jobs carried to completion during the year. Hydroelectric plants on the Mississippi and Ohio rivers have been completed and a number of viaducts with an average length of 2,000 feet are under way or opened for traffic in Cincinnati, Pittsburgh and Columbus. A number of large privately owned buildings have gone up, the two Ford buildings in Detroit attracting most attention. The Chicago & Northwestern completed a 1,300-foot tunnel in Wisconsin, and the Union Station in Wichita, Kansas, has been opened to the public. Across the line in Canada, Winnipeg has awarded contracts for an 85-mile aqueduct to be built entirely of reinforced concrete.

Pacific States

The ports of the Pacific coast are building docks in preparation for the Canal trade. The Big Creek and Jordan River hydroelectric plants in California and Vancouver Island, respectively, are both large jobs, but the first is specially worthy of note, involving much difficult construction high up on the steep slope of the Sierra Nevada range. In San Francisco work is proceeding on the sewerage system, and two traffic tunnels, one 900 and the other 13,000 feet long. The temporary purpose of the exposition buildings has in this instance relegated concrete to a secondary place.

The development in reinforced concrete stadiums for athletic contests has been interesting. Yale has her Bowl, and Lehigh, Princeton, Michigan, and the College of the City of New York each a stadium, those of Lehigh and the New York college as yet unfinished.

The Future

Progress in reinforced concrete must continue along lines similar to those of the past few years, with more and more attention in practice to the theory of design; to the treatment of small details; to the design of joints in monolithic structures; to the selection of aggregates; to weathering qualities; and to economy in construction. On the artistic side there is coming an artificial stone of lasting quality produced under shop conditions and tool-dressed as is natural stone.—Engineering Record.

EDWARD M. HAGAR TO HEAD NEW CEMENT COMPANY

Announcement has been made of the resignation of Edward M. Hagar as President of the Universal Portland Cement Company, one of the subsidiaries of the United States Steel Corporation. Mr. Hagar has been the head of this cement business for fifteen years and manufactured the first barrel in May 1900. The company has been conspicuously successful as shown by the growth of its business from 32,000 barrels produced in 1900 to its present capacity of approximately 12,000,000 barrels per year. For several years the Universal Portland Cement Company has been the largest shipper of Portland cement in the world.

Mr. Hagar was for two years President of the Association of American Portland Cement Manufacturers and has been an important factor in the promotion and development of the use of cement in building construction of all kinds. He also founded the Cement Prod-

ucts Exhibition Co., in 1907. This company conducts the annual Cement Shows, which are recognized as among the most important industrial exhibitions held annually in the United States.

The Massachusetts Institute of Technology and Cornell University both claim Mr. Hagar as an alumnus. He was graduated from the former in 1893 and received a post-graduate degree from Cornell in 1894. Before becoming connected with the cement industry, he organized and conducted the business of Edward M. Hagar & Co., located in Chicago and acting as sales representatives for machinery manufacturers.

Mr. Hagar retires to assume the Presidency of a new company which he is forming to acquire a chain of Portland cement plants covering a large part of the United States. The headquarters of the new company will be in Chicago.

REGULATING CONCRETE PRODUCTS

A western city reports a "hot fight" between two makers of concrete products. One, whose block are stated to have been repeatedly condemned by the building authorities, complained that the requirement of resistance to 600 lbs. pressure per sq. in. was excessive and unnecessary. The other claimed that it was not high enough and petitioned the council for permission to make inferior block, in order that he might meet competition. Failing this, he urged that his competitors should be obliged to make block with a higher resistance.

These two men represent the two wings of the army of concrete block men. In every community, large or small, there is always at least one man who wants to be allowed to turn out a product that will just stand up and no more. He objects to building regulations because he is either too lazy or too indifferent to take the trouble to live up to them. The other end of the line welcomes reasonable restrictions, for a number of good reasons. Properly enforced, they insure the production of block that will make friends and sell more block—and they make it impossible for the man who is careless or dishonest to market his product.

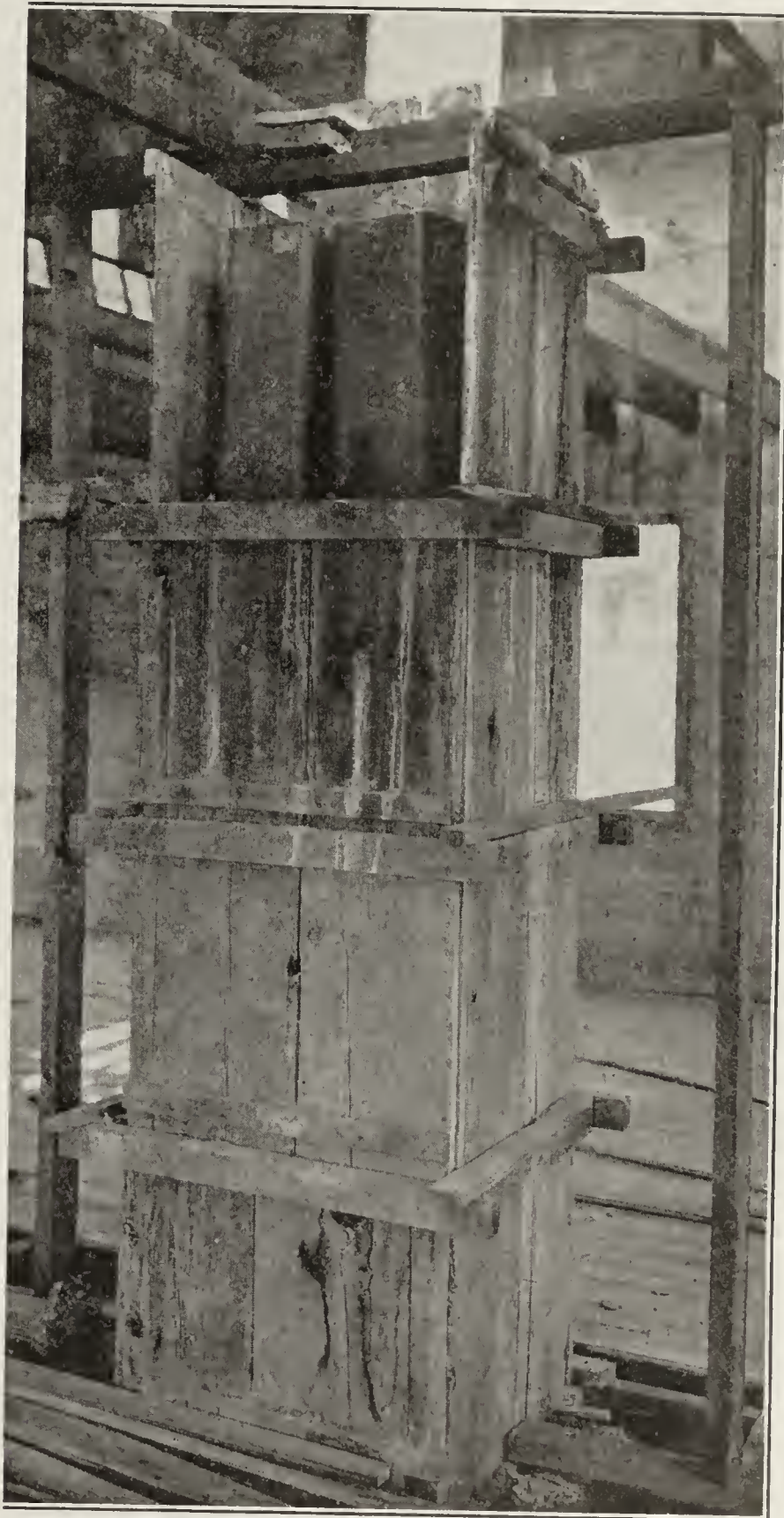
What the concrete men in every city ought to do is to get together and organize. A careful investigation of the building code should be made to see that the requirements for concrete are adequate and not unreasonable. They should be so worded that concrete must be safe in every particular and yet not penalized in competition with other materials. No reasonable man can object to specifications for his material which insist that it shall meet every requirement imposed on competing material used for the same purpose. No reasonable man will be content to see specifications for his material that are any higher than those under which competing material is permitted to be used. No reasonable man will sit still and see a competitor in his own line use material which does not pass the tests demanded in his own case.

In a number of cities the concrete men are getting together, forming small but efficient organizations. What they are working for are requirements that are reasonable, safe and uniform for everybody. They are going before the councils and the public, as a body, with a plain statement of what they want. When they get it, they are just as careful to see that they live up to established requirements as they are to see that the maker of inferior materials is barred from competition. A greater spreading of this sort of co-operation would do more than almost anything else to increase the confidence of the public in concrete block construction. [Concrete-Cement Age.]

CONCRETE CHIMNEYS

An examination of fire statistics would show that defective flues are the cause of a great majority of the fires that occur in dwellings. It is an old saying among architects that money put into a thoroughly good chimney is never wasted. So far as safety from fire is concerned, the chimney is the most important structural feature of a building. But almost countless fires have shown that careless workmanship, and in some cases bad design, in chimney construction prevail to an alarming extent.

A properly constructed chimney should be a seamless monolith, and in recognition of this fact builders are now using concrete. Concrete chimneys are



A Concrete Chimney in Process of Construction. The Flue Lining Inside the Wooden Forms Serves as the Inner Form.

poured in a plastic state and harden into so much solid stone. They have no joints, and sparks or burning soot cannot come into contact with surrounding woodwork.

How Concrete Chimneys Are Built

Small concrete chimneys can be constructed in two ways. An outer and inner wooden form, between which the concrete is poured, can be used, or the inner form may consist of a clay or concrete tile, either

round or square in section. Where the tiles may be procured easily, it is a more simple operation to use them for the inner form.

Foundation

All chimneys, regardless of size, should have good foundations. If the chimney is not carried down to the depth of the cellar, it should have the foundations at least below frost line. For ordinary conditions a depth of three feet below ground level will suffice. The foundation consists of a concrete slab 12 or 18 inches thick and 9 inches larger on every side than the outside dimensions of the chimney. Where the house is constructed with concrete walls, the chimney is cast as an integral part of the walls, and, consequently, needs no separate foundation.



A Concrete Chimney of Ornamental Design.

Forms

The forms necessary are simple and easily made. Fig. 2 illustrates the method of constructing forms and the manner in which they are held securely together. In this illustration will be seen the two flues which constitute the inner form. To make the depositing of the concrete and the placing of flues an easy matter, forms are built up as the work progresses. Where the chimney is hidden by interior plaster and the walls of the building, only rough forms are required, such as are shown in Fig. 2. When roof level is reached more attention must be given to the forms in order to secure

a smooth and even surface. Therefore see that the boards form tight joints and that each section of form is properly aligned.

If desired the chimney can be relieved with a simple ornamental design, such as is shown in Fig. 1. In providing for this it should be remembered that the ornamentation must be placed on the inside of the outer form and that the design will be reversed on the surface of the chimney.

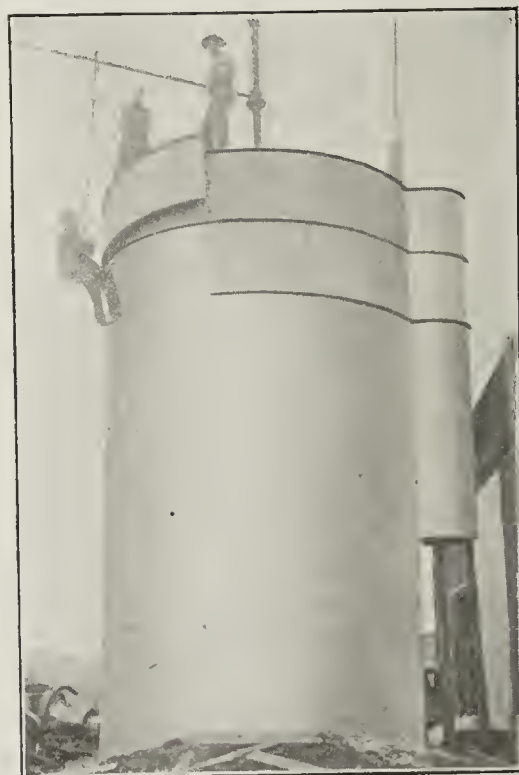
Concrete and Reinforcement

Concrete for this work is proportioned 1 part Portland cement to 2 parts sand to 4 parts crushed stone or gravel. In mixing the concrete it is convenient to remember that 1 bag of Portland cement is equivalent to 1 cubic foot, so that the proportion can be stated as 1 bag of Portland cement to 2 cubic feet of sand to 4 cubic feet of stone. A bottomless measuring box of 2 cubic feet capacity is convenient in measuring the materials. The concrete is mixed mushy wet and well tamped and spaded into the forms.

While not absolutely necessary for small chimneys, it is a wise precaution to embed vertical $\frac{3}{8}$ -inch or $\frac{1}{2}$ -inch steel rods in each corner of the chimney. It is often the custom to wrap the tile flue forms in one or two thicknesses of tar or building paper so as to leave a small space around the flues, thus allowing for expansion of the concrete when heated, the purpose being to prevent it from cracking.

MONOLITHIC SILO MOLDS

During the Cement Show in Chicago, the Conklin Construction Company, of 430 Main Street, Hartford, Michigan, made a private exhibit in the Fort Dearborn



Hotel, showing in model form cement molds for reinforced monolithic concrete work, together with a lot of valuable accessories that go to make silo building more durable, convenient and profitable.

Mr. Elon K. Conklin, the president, conducted the demonstrations, and it was pretty well conceded that Mr. Conklin has worked out not only a system away in advance of competitors, but that he has provided mechanical equipment for the carrying out of the Conklin plan that will enable the cement contractor to make much more money in silo construction work than he has ever been able to make before. All of this is explained in their catalog, which they will send to any one who asks for it.

CONSTRUCTION OF THE FALLSWAY VIADUCT, BALTIMORE, MD.

Louis R. Gons*

As is well known, the city of Baltimore until a few years ago had only a partial storm sewer system and practically no sanitary sewers. The few private sewers were located indiscriminately in the streets and led to the nearest water course. The principal water course to serve this purpose was Jones' Falls, a small stream with a low normal flow, but often subjected to a maximum storm flow of 15,000 cubic feet per second. This stream passes practically through the business section of the city to its mouth in Baltimore harbor. As a result of the considerable house sewage lead to this stream, it practically became a filthy, open sewer, subject to the back water caused by the tide, which often backed this sewage well up into the city.

Partly to relieve this offensive condition and partly to provide a new street, it was decided to cover this stream. It was thought that this new street would carry a very considerable traffic between the wharf at its lower end and the Baltimore & Ohio and Union railroad stations at its upper end. There is at present no route which this traffic can follow except by going over a succession of small hills, over which it is exceedingly difficult to carry heavy trucking, so it is reasonable to suppose that this new roadway will be subjected to heavy and useful service.

Beginning at a point just south of the Union station, the Falls enter a 1,200-foot tunnel, 29 feet in diameter, which cuts off a horseshoe curve in the original bed of the stream. At the south end this tunnel enters a conduit 5,500 feet in length, extending to a point just south of Baltimore street, where it enters an open channel leading into the harbor. The roofs of these conduits serve as a base for the new paved street from Baltimore to Madison streets. The upper end of these conduits, however, is about 35 feet below the surface of the street (Biddle street). It was, therefore, necessary to carry this new roadway up from Madison to Biddle streets on a viaduct 1,500 feet in length on an average grade of 3 per cent.

The southern or lower end of the viaduct is an earth fill between two retaining walls, reinforced by counterforts extending into this fill. From this point to the upper end the viaduct is a series of seventeen sets of arches carrying the roadway on reinforced concrete floor system. There are nine arches in each set spanning between transverse girders, which in turn rest on piers which foot on bases continued up from the walls of the conduit. Stubs were left in the roofs of the conduits where the piers of the viaduct were located, insuring a good bond between the piers and the foundation. As a rule, the transverse girders are at right angles to the center line of the viaduct, but between Eager and Chase streets the girders had to be put on a skewed line to permit the passage of the Pennsylvania railroad trains under the viaduct on a reasonable degree of curvature. Outside of this skewed crossing the viaduct is of fairly regular construction.

The retaining walls at the lower end are of reinforced concrete 20 inches thick, with a 24-inch base, and are strengthened every 27 feet by counterforts on the inside. The steel reinforcement consists of $\frac{7}{8}$ -inch square bars spaced 4 inches center to center near the bottom and 8 inches center to center at the top. These bars are held in place by $\frac{1}{2}$ -inch verticals spaced 15 inches apart. The counterforts are 2½

feet wide, and vary in thickness from 4½ feet in the middle to 2½ feet at the ends.

The main girders are 3 feet wide by 6½ feet deep, reinforced by 1¼-inch straight and trussed bars, and are supported by five piers 10 feet long and 2½ to 3 feet wide, thus making the span between piers about 19 feet. There are nine arches in each span, four of these arches springing from the mid spans of this girder between piers. The skewbacks for these arches protrude the same distance from the center line of the girder, as do the skewbacks at the piers, making it possible to use the same size centering for all the arches in a set.

The arches are made 2 feet 6 inches deep at the crown and 3 feet 6 inches at the haunches, and are formed to the arc of a simple circle. The rise is 1:7.8, making a rather flat arch. The three central arches are made 3 feet wide and are reinforced with 4 1-inch bars spaced 3 inches from the upper, and 4 1-inch bars 3 inches from the lower surfaces. The other inside arches are 2 feet 6 inches wide, the outside arches being 2 feet 8 inches wide, reinforced with 3 1-inch bars near the upper and 3 1-inch bars near the lower faces. Two extra bars are used in each arch from the springing line to the quarter points. Near the center of the span pockets are made in the arch to contain the transverse floor beams of the floor slab, while out toward the ends of the arches posts are built up to support the beams which come over this section. The outside arches are built up solid to the belt course, and have the usual decorative panels placed in them. Some of the arches at the beginning of the skewcrossing are so placed that the center line of one is not in line with the next arch ahead, but changes its direction a little. This creates a thrust along the line of the girder, which is taken care of by reinforced X braces between piers, to prevent them from tipping over in line with the girder.

The floor slab is provided with expansion joints over each girder, so that the length of solid slab is never more than 64 feet. There is an expansion joint placed between the outside spandrel walls and the adjacent piers to permit a free rise and fall of these arches. This expansion joint runs from the top of the arch up to the top of the parapet.

The cement used is required to pass the usual tests, and in addition must stand up under the autoclave test for soundness. A 1:2:4 mixture is used, gravel being mixed for the interior works and crushed stone for the outside concrete, which is afterwards dressed. There are in all about 14,000 cubic yards of concrete and 800 tons of steel reinforcement in the structure. The price bid for the outside concrete in which broken stone is used was \$9.25 per yard, and for the inside concrete in which gravel is used \$8.90 per yard. The total contract price is \$190,693.15.

The plant is almost centrally located with respect to the viaduct. It consists of a mixing plant at the foot of a 205-foot tower situated on the north side of Eager street. The tower is shown in Fig. 1. The surface of Eager street at this place is carried on a stone arch bridge about 25 feet above the bottom of the tower. The material bins are placed immediately alongside this street and between it and the tower, and are built in three compartments, one of 50 cubic yards capacity for gravel, one of 25 yards capacity for crushed stone and one of 30 cubic yards capacity for sand. The tops of the bins are about 2 feet above the surface of the street and two runways extend over these tops and run down on a short slight incline over the sidewalk to the street to provide for filling these bins with sand and gravel, which is hauled by motor trucks. Each of the bins has a sliding door

*Engineer with Claiborne, Johnston & Co., Baltimore, Md.

on the bottom which allows material to drop into a measuring box, from where it discharges directly into the mixer. Underneath Eager street, on the same level as the tops of the conduits and parallel to them, is a private siding for the unloading of crushed stone and other material coming by rail. The stone is lifted by a bucket elevator of 250 tons capacity per day into the bins.

The cement house is situated on the north side of the tower and alongside this private siding, so that the cement can be unloaded directly from the cars into this house, which has a capacity of eight carloads. The cement is wheeled by hand a distance of 40 feet to the measuring box.

From the mixer the concrete is discharged into a

middle of every other panel. The pieces were all cut to size and holes for the bolts bored before the timbers were placed in the tower. Two guides made of 4x4-inch Georgia pine are placed on the inside of the tower, between which the bucket is made to run. The gin pole used in erecting the tower was constructed to slide between these bucket guides, so as each section of the tower was completed the gin pole could be easily pulled up into the completed section and placed in position for hoisting the timbers for the next section above.

The tower is guyed by four sets of lines, one at the top and the others spaced further down on the tower. These guys are of $\frac{5}{8}$ -inch crucible steel cable, and are fastened to deadmen buried in the ground. Over the

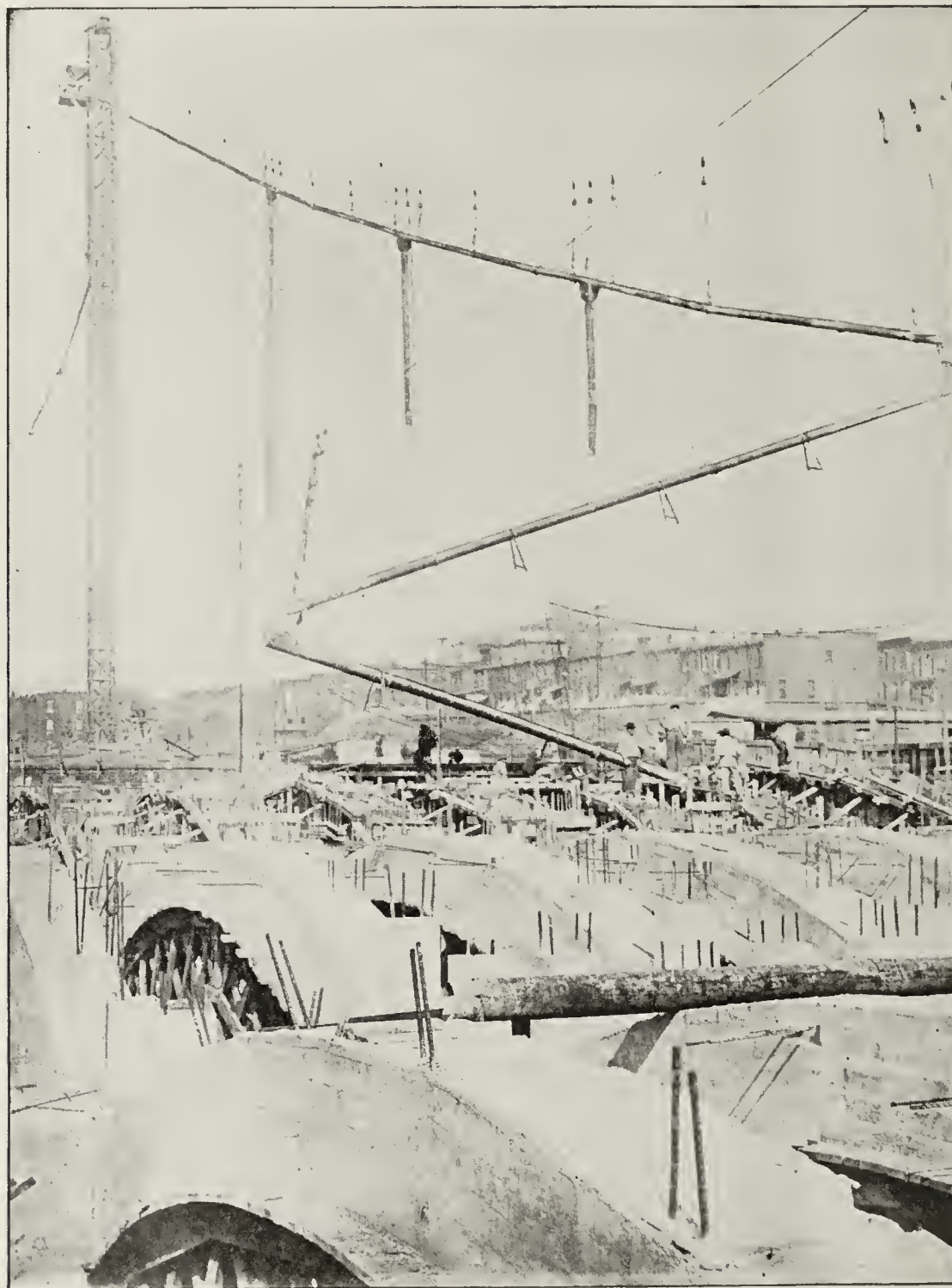


Fig. 1. Tower and Chutes for Distributing Concrete.
The Chutes are Manufactured by the Insley Mfg. Co., Indianapolis.

$\frac{1}{2}$ -yard capacity bucket, which is then hoisted up the 200-foot timber tower, and automatically dumped into a hopper when it reaches the top. The steam plant in connection with this hoist and mixer is provided with two boilers to insure continuous operation in case of accident to one of them.

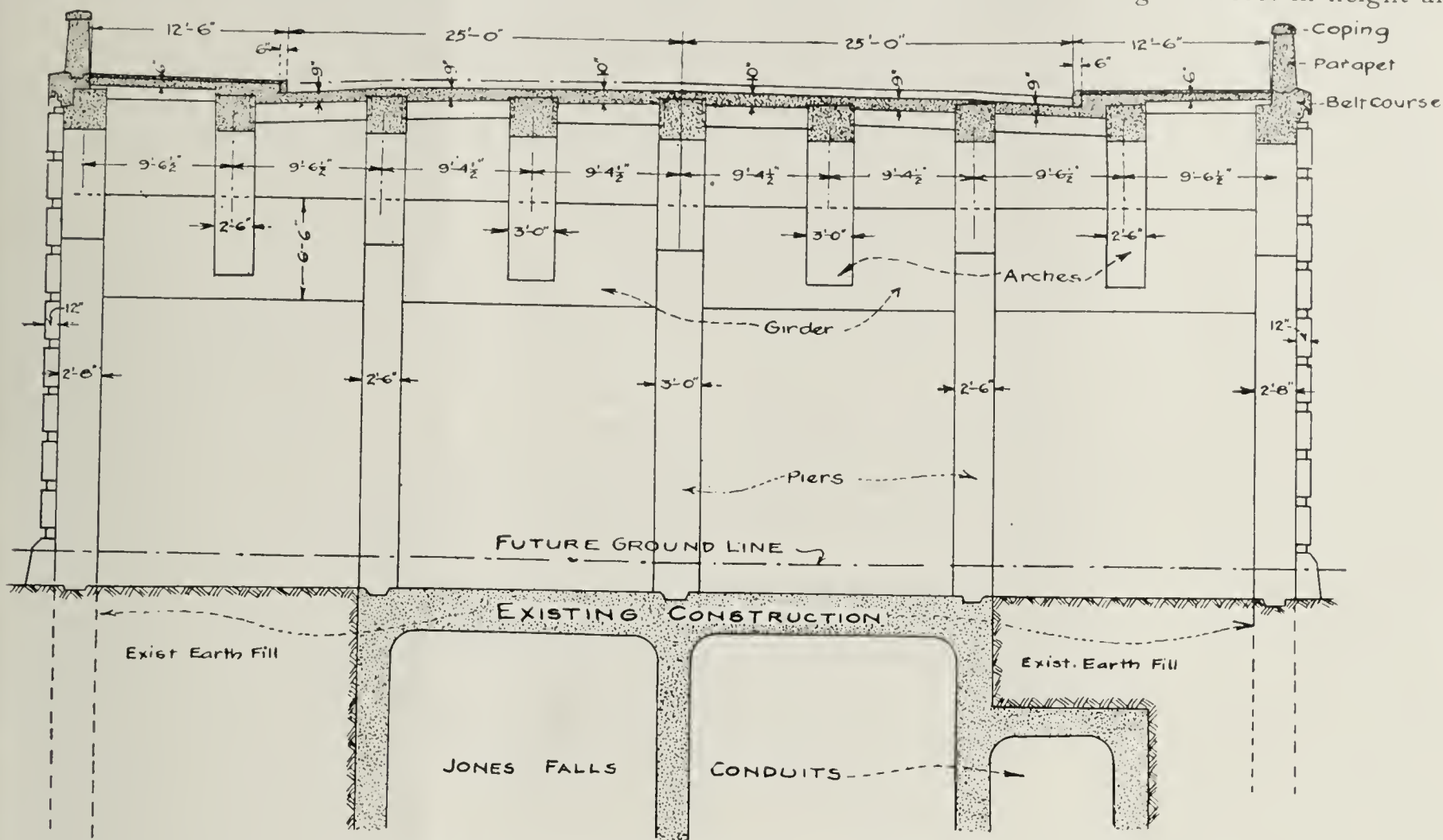
The tower is built of four 6x6-inch vertical posts of 14-foot lengths, braced horizontally and diagonally with 2x6-inch members. These diagonal braces form panels 7 feet in height and 6 feet wide, the braces being fastened to the posts by one $\frac{1}{2}$ -inch bolt at each end. The 14-foot posts are placed so as to break joint in the

top of the tower the main cable is supported by two 14-inch sheaves and from this cable the main line of chutes is hung.

The concrete, which is dropped into the hopper at the top of the tower, is released by hand into the Insley chutes, which are made up of steel plates bent into a 10-inch three-quarter round trough, and are hung from the main $1\frac{1}{4}$ -inch cableway by blocks and falls. The chutes are made up in 10 and 20-foot lengths, which can be added to each other to make a maximum length of 450 feet along the viaduct. At intervals along this line of chutes line gates or hoppers

are provided, so that this line can be tapped at any convenient point to supply concrete where it is desired. The main line of chutes is directly over the east face of the conduits; it is, therefore, necessary when concreting along the westerly line of the conduits to use laterals connected to the line gates of the main chutes.

fore, to build a second tower and plant at Biddle street for placing the concrete north of this point. Owing to the congested conditions there, however, it was impracticable to build a new plant for this portion of the work. A new tower was erected at the north side of the Chase street bridge 185 feet in height and

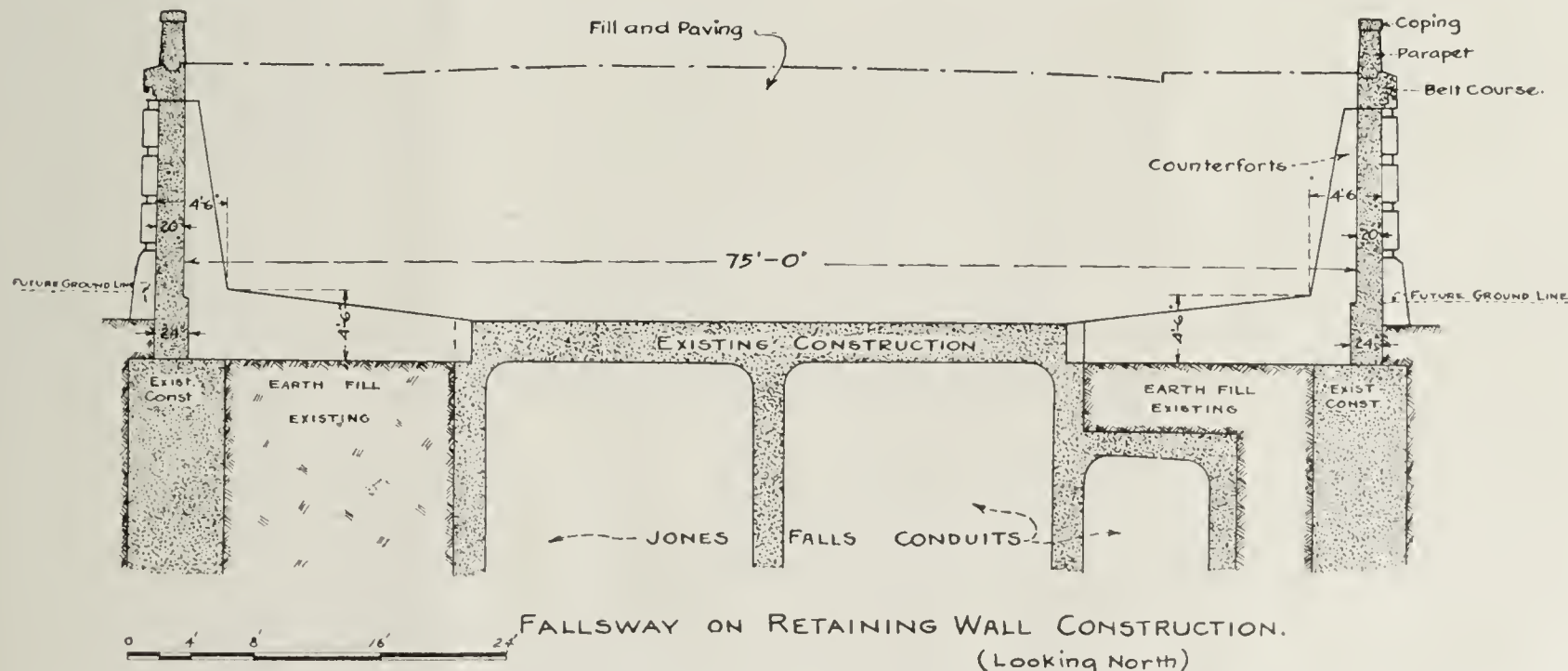


FALLWAY ON ARCH CONSTRUCTION. (Looking North)

the lower ends of these laterals being suspended from an auxiliary cableway about in line with the center of the viaduct. It takes from 40 to 60 seconds for the bucket to make a round trip from the mixer to the top of the tower and down again. The maximum capacity for the plant has been thus far 160 yards in a ten-hour day, but there has never been occasion to

guyed with three sets of wire ropes. It is proposed to chute the concrete from the top of the old 205-foot tower into a hopper at the base of the new tower. It will then be lifted in a bucket in this second tower and delivered to the parts of the viaduct not reached from the first tower.

For the retaining walls, belt course and parapets



FALLWAY ON RETAINING WALL CONSTRUCTION. (Looking North)

press the plant to a greater capacity. The concrete comes out thoroughly mixed and the system as a whole has proved very satisfactory.

The portion of the viaduct north of Chase street is, because of its distance and weight above the tops of the conduits, inaccessible from chutes suspended from this tall tower. It was originally planned, there-

at the south end of the viaduct a small traveling mixing plant 14 feet wide and 20 feet long is used. A mixer, hoisting engine and a 30-foot tower are mounted on the floor of this car and the concrete is dumped into a bucket as in the main tower. From the hopper on top of the tower the concrete is run through a chute into the forms. This car is never

more than 25 feet from the point at which it is desired to concrete, so that one section of chute is sufficient. Material is supplied by barrows, the cement being stored in a second supplementary cement house near the lower end, the sand and gravel being dumped immediately alongside the traveling mixer by the motor trucks.

Another small traveling mixer is used to pour some of the small parapets and sidewalks. It is mounted on a truck built high enough to enable the concrete to readily run into forms 3 or 4 feet high. This little mixer is driven by a gasoline engine and the material is thrown up by hand.

Along the west side of the walk just below Eager street are located the carpenter and blacksmith shops, with field office and storeroom between them. The carpenter shop is fitted with electric driven band saws, rip saws, joiners, etc., which are used for cutting out the standard details of the form work. The contractors maintain an office in which drawings and details are made in order to save as much time in the field as possible. In this way much of the form work can be cut out and built up before it is put in place. The blacksmith shop is in steady service in making repairs to the general plant, as well as building steel forms for the coping blocks, sharpening the knife edges for the hammer dressers, etc.

Under the Eager street bridge an electric driven air compressor plant is installed, and a pipe line is run the entire length of the job to operate the pneumatic hammers used in surfacing the concrete. This air line is also used to run the pneumatic boring machine wherever necessary in connection with the carpenter work.

There is also on the works a locomotive crane used to lift the centers for the arches in position and move them from place to place.

The general order of procedure is to pour the piers up to the level of the bottom of the girder, then the remainder of the piers are poured with the girder and the intermediate skewbacks. The arches are then poured, and are followed by the roadway floor slab, which is poured as soon as the next set of arches ahead is in place, or else the girder properly braced. The belt course and the sidewalk slabs are then placed and finally the parapet and coping blocks.

In the piers a little difficulty was experienced at first in preventing the grout from remaining near the surface, causing streaks to show when the piers were hammer dressed. This was overcome by placing chicken wire about a foot from the surface and placing the concrete between it and the surface by hand. This brought the stone to the outside, giving a very pleasing effect when hammer dressed. The hammer dressing is done with pneumatic hammers and the tools used are sets of four knives bolted together. This is done in order to give a slight lined effect. At the beginning trouble was found in hammer dressing the many edges of the piers and belt course. These had a tendency to break off. After inspecting a great deal of work, the engineers decided to rub all edges and finish them sharp, making a line about 1 inch from the edge. The surface was then hammer dressed up to this line and the edge left sharp, giving a very pleasing and finished effect.

The forms for the piers are built of 2-inch lagging, with 2x6-inch vertical studding spaced 30 inches, and the same sized horizontal wale. Rods are run through the pier and held by universal clamps to keep these wale from spreading. These clamps are also used in the spandrel walls, girders, and wherever there are large surfaces in the form work. The girder forms are made of the same sized lumber as the piers. The arch

centering consists of two trusses for each arch, each truss being made up of two similar halves, bolted together at the center of the arch. There are six panels in each half averaging 4 feet in length and 3 to 4 feet in depth. The diagonals are made out of 2x6-inch and the lower chord of 2x8-inch timbers. The upper segment boards are cut from 2x10-inch lumber. These are joined together by $\frac{7}{8}$ -inch bolts with Ogee washers, making in all a truss with a large factor of safety. Two-inch lagging is used over these trusses to form the bottom surfaces of the arch.

After the arches are poured the centering is left in place for twenty-eight days and is used to support the joists for the forms for the floor beams and slab. These forms are made of 1-inch lagging supported by 2x6-inch joists. The forms for the belt course are held by braces resting on the centering for the outside arch. All edges of the floor beams, girders, arches, etc., are beveled, the size of the bevel varying with the size of the members. The forms for the coping blocks were made of $\frac{1}{8}$ -inch steel plates in sections 7 feet long. The edges were strengthened with small angle bars and the whole mounted on timber yokes.

Up to the present the viaduct is finished up to the first set of skewed arches, from which the centering has been removed in order to allow the Pennsylvania railroad to throw their outside track through this set. This track will rest on ballast supported directly by the roofs of the conduits, which have been designed heavy enough to carry standard Pennsylvania loading anywhere over their entire length. The present bridge, which is no longer of any use, will then be wrecked and the two remaining tracks moved out of the way of the next girder. This girder will then be built and the intervening arches poured, after which the tracks will be thrown to their final location.

Beyond the railroad crossing enough form works for 1,400 yards of concrete have been built, while the chutes were taken down from the old cableway and the new tower at Chase street erected. The new plant will be ready for operation in a short time, enabling the work from the railroad crossing to the upper end to be completed while the railroad is making the necessary changes below. The removing of the Chase street bridge also comes under this contract, and this will be wrecked after the piers for the viaduct underneath this bridge have been poured. These will take the place of falseworks in taking down this structure. A stiff-legged derrick is being placed at Chase street to be used for this purpose and will be operated by the same engine that hoists the bucket in the new tower at this place.

The entire work is under the supervision of Calvin W. Hendrick, consulting engineer for the city, and is being done by Claiborne, Johnston & Company, with Elliott Vandevanter as chief engineer. Albert Ponesmith is construction superintendent for this contract.

ATLAS CEMENT COMPANY.

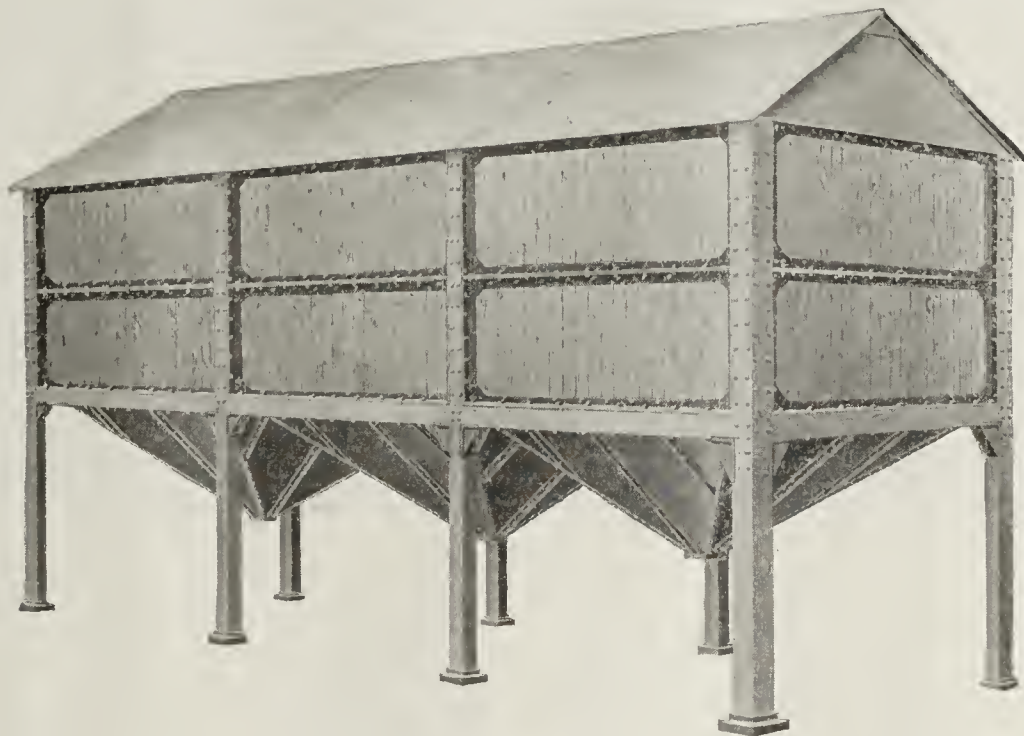
Prospects are very bright for a renewal of work at Mill No. 4 of the Atlas Cement Company's works at Northampton, Pa. For the past two years the mill has been on half time. For some time past repairs have been going on at the mill which are about completed and the belief is prevalent that the mill will start up full time about February 10th. Employment will be given to an additional force of 300 men, with double shifts. Word is expected daily from the headquarters in New York to put the extra men at work in anticipation of the brisk trade that is sure to come with the new year.

A UNIT SYSTEM STORAGE BIN

Something entirely new in the concrete contractors' equipment has been developed in the Weller unit system storage bin shown herewith.

The principal intent of this outfit is to aid in economical handling of concrete aggregates and actually to give to a batch mixer the theoretical capacity of a continuous mixer, and likewise increase the capacity of the latter machine.

The economical feature is obtained by taking the materials direct from cars by the method most adaptable to the conditions, and storing the stone, sand and cement in separate compartments, so that without any handling other than simply moving a lever the material may be either spouted direct to the charging box of the mixer or brought to the box by simple and suitable conveying mechanism. Write the Weller Mfg. Co., Chicago, Ill., for circular, prices, etc., and mention Cement & Engineering News.



Weller Unit System Storage Bin.

FREIGHT RATES ON CEMENT.

That the Interstate Commerce Commission has a right to project its authority to protect localities and markets from railroad discrimination was the prime effect of the decision rendered recently by Judge Woolley in the United States district court. The point at issue was whether a freight rate of \$1.35 per ton on cement shipped from Evansville, in the Lehigh district, via the Reading railway to Jersey City, is prejudicial to the cement trade at the New Jersey terminal.

The legal propositions raised by the railway company that the commission went beyond its jurisdiction in deciding that a non-complainant was discriminated against, Judge Woolley decides, are untenable, and he directs that the order of the commission that the railway company rescind its \$1.35 rate, and establish one conformable to a more competitive basis for the Allentown Portland Cement Company, the original complainant.

Complaint was made to the commission by the Allentown company that the Reading's rate of \$1.35 a ton for cement shipped from Evansville to Jersey City was unreasonable, discriminatory, and furnished an advantage to its competitors in the same district. The commission found, however, that the rate was not unreasonable, nor did it expressly find that by the rate that the Allentown company, or the "locality" of Evansville, was discriminated against.

But in its report, the commission stated that by the rate the Allentown company was caused to labor under a prohibitory disadvantage in marketing its product

at Jersey City in competition with other mills in the same manufacturing district. The commission unequivocally found, however, that the actual sufferer was the cement market at Jersey City through the alleged prejudice and discrimination.—[Philadelphia North American.]

CHICAGO PORTLAND CEMENT COMPANY.

Norman D. Fraser, president of the Chicago Portland Cement Company, surprised his employes with a post-Christmas present.

Every employe received an increase of from \$125 to \$500 a year in salary.

"I am satisfied with the money I have earned," said Mr. Fraser. "You have helped me to make my money and now I want you to make a little money yourselves."

He explained that the war had not depressed his business and that the outlook for the coming year was

excellent. A fund of \$10,000 has been provided for the increase of salaries.

REINFORCED CONCRETE BUILDING

An addition is being built to the Gormully & Jeffery Tire Co.'s plant at Indianapolis, now owned by the United States Rubber Co., and is an excellent example of modern reinforced concrete design. The building will be used for the storage of finished tires on the upper floors and for manufacturing and the storage of raw materials below. It is of six stories and basement, is 80 feet wide by 170 feet long, is designed for 200 pounds live load and has two short wings at either end, enclosing the elevators and stairways.

The design is unusual, involving girders of the full width of the building, no cross beams and cantilever floor slabs. The girders have a depth of 26 inches measured to the top of the floor slab and span 26 feet between columns. They are reinforced with steel reinforcing bars and the columns are reinforced with rib bars and are hooped in all stories except the top. The floor has a span of 22 feet and a thickness ranging from 12 inches at the girders to 5½ inches at the quarter points and continuing at this thickness over the center half of the span. The reinforcement is continuous over the girder and the upper steel drops to the bottom of the slab at the quarter point where the cantilever action stops. This system of design has given maximum head room in each of the eight bays and lighting from both sides without obstruction from beams.

The footings, retaining walls, sidewalks and stairs

are of reinforced concrete and the sills are also of concrete cast all at one time and placed after hardening. The entire frame was poured during cold weather, the temperature ranging as low as seven degrees above zero, but by careful protection with canvas and heating with salamanders the work was uninjured. No concrete was poured when the temperature was below thirty degrees. Concrete was deposited by means of a tower and chute and was handled entirely from one tower. The finished exterior

furnished by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis. The three kilns now in use are 80x7 feet. These will be fastened onto the new ones, making kilns 200 feet long.

EFFECT OF ADDING HYDRATED LIME

During the past year, Henry S. Spackman, a prominent engineer of Philadelphia, conducted a series of tests to determine how the addition of hydrated lime affected the change in volume of Portland cement mor-



New Reinforced Concrete Building of the U. S. Rubber Co., Indianapolis, Ind.

will expose the concrete frame, the curtain walls being brick and inset $1\frac{1}{2}$ inches. A building of reinforced concrete was believed to be particularly adapted to the storage of rubber goods because of the low temperatures possible to maintain throughout the summer. The fourth floor will have no windows, but merely ventilating openings, which will be kept closed during hot weather. In the experience of the owners it will be possible to maintain a temperature as low as fifty or sixty degrees Fahrenheit through the warmest weather, a condition ideal for the storage of rubber goods.

The contractor was Wm. P. Jungclaus Co., of Indianapolis.

CEMENT COMPANY SELLS OUT.

The Lake Shore Portland Cement Company, Sandusky, Ohio, incorporated eight years ago with a capital stock of \$1,000,000, practically passed out of existence on December 10th, when cement-making machinery, much of it never used was sold to the Castilia Portland Cement Company and approximately 500 acres of marl land, west of Sandusky, to the Sandusky Portland Cement Company. The total consideration was \$68,000.

ATLAS CEMENT COMPANY

Mr. A. G. Croll has been appointed to act in capacity of general superintendent of the Atlas Portland Cement Company with headquarters at New York. Mr. W. H. Baker has been made assistant general superintendent, western district, with headquarters at Hannibal, Mo.

PENINSULAR CEMENT COMPANY.

The Peninsular Portland Cement Company is erecting a new building at Cement City, Mich., that will house three new rotary kilns, each 120x9 feet, to be

tar and concrete test pieces under different conditions of exposure. The results were announced at the annual meeting of the Lime Manufacturers' Association. Mr. Spackman considered that it had been sufficiently proved that a reasonable percentage (say 10 per cent) of hydrated lime, added to cement mortar or concrete, increased the plasticity and impermeability of that mortar or concrete without materially affecting the strength. The effect on change in volume, however, had not been hitherto demonstrated.

In the opinion of the author, the test showed that variation in moisture content affects the volume of a mortar test piece more than change in temperature; but, when kept from contact with water other than moisture in the air, there is a marked tendency to shrinkage of the test piece, which tendency continues up to and beyond the six-month period. When the test piece is in constant or frequent contact with water, the general tendency is toward expansion in volume; but, with the draining-off of the excess gaging water, there is a marked shrinkage at the 24-hr. period, followed, in some cases, by expansion in 48 hrs.; and further shrinkage if test pieces are out of contact with water, and expansion if in contact with water. But the addition of hydrated lime, while increasing somewhat the maximum expansion and contraction when the test specimens are constantly exposed either to water or the dry air, markedly reduces the shrinkage due to the draining-off of the surplus gaging water, and also the extent of the movement when the test piece is alternately wet and dry.

The conclusion of the investigation was that the addition of hydrated lime will be found advantageous under ordinary climatic conditions in concrete work generally, where it is exposed either to air or to fresh water; and concrete to which such additions have been made, besides being more impermeable, will show less change in volume under varying moisture content.



Smith Mixerette Facts and Figures

The Bleicher Concrete Co., Kenosha, Wis., purchased the first Smith Mixerette that was built. Here's what they have to say about their machine and some of their records as given in their letter of October 26th, 1914.

"We bought one of your Smith Mixerettes six months ago and find it to be a great labor saving machine. With three men we are able to put in 1,000 square feet of sidewalk in 9 hours with the aid of your mixer. Recently I put in a foundation 35 ft. by 42½ ft. by 1 ft. (55 cu. yds.) with your Mixerette in 9½ hours.

"It is a wonderful machine and I can recommend it to any one desiring to reduce their labor expenses, for I know how much can be accomplished with it."

This dandy little mixer holds a five-foot batch of dry, loose material, 3 cu. ft. of mixed concrete. It will easily turn out 5 cu. yds. per hour.

Compared with other five-foot mixers, the price of the Smith Mixerette is as low or lower and back of it is the guarantee of the biggest concrete mixer manufacturers in the country.

\$128.00 on skids with pulley and feed chute.

\$246.00 on steel truck with 2 h. p. gasoline engine, steel house and low charging, gated batch hopper.

\$315 on steel truck with 2 h. p. gasoline engine, steel house and ground level power charger.

Get all the data by filling in and mailing the Coupon for Mixerette Proposal and Booklet No. 107-B.

MAILING COUPON

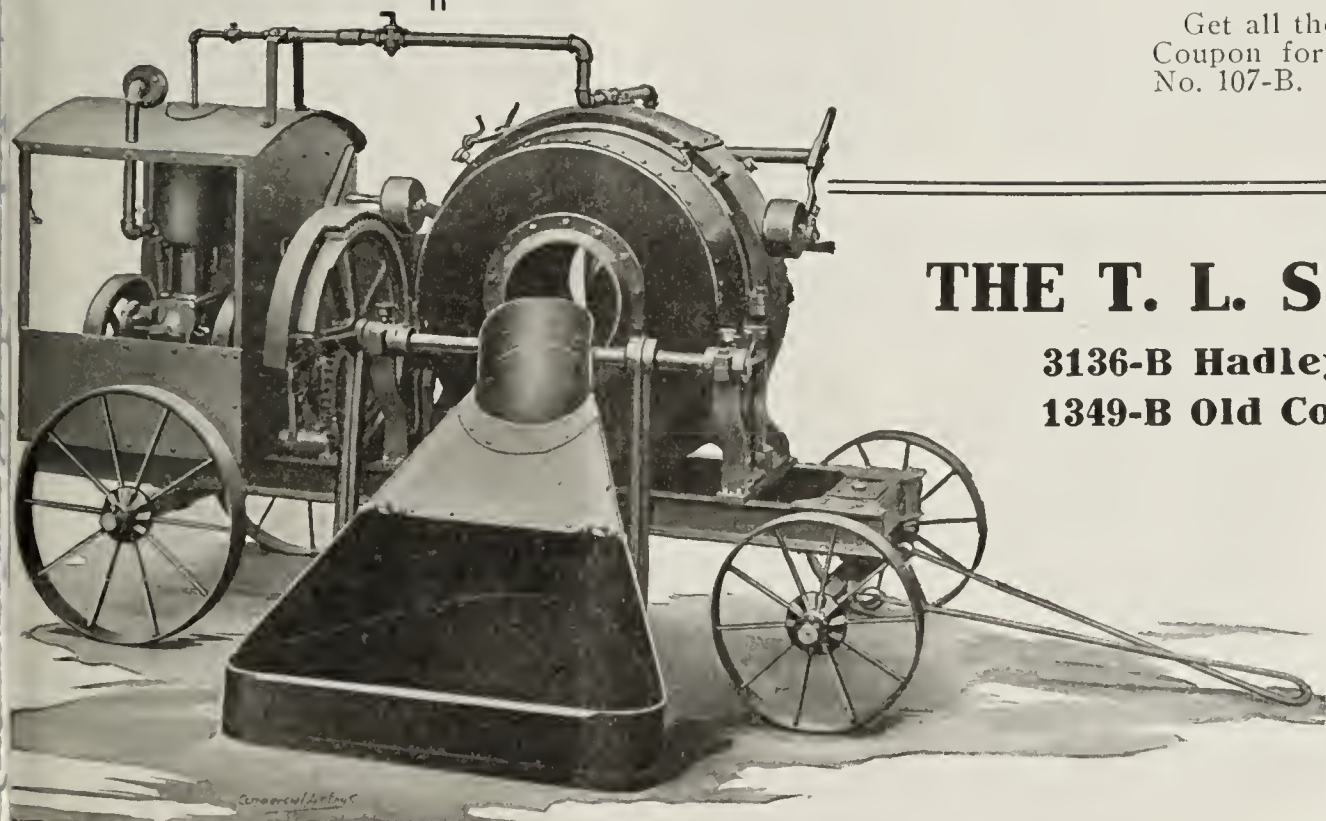
Send me, without any obligation on my part, SMITH MIXERETTE Proposal and Booklet No. 107-B.

Name.....

St. Address or P. O. Box.....

City..... State.....

NOTE—Fill in this coupon and mail it to either address given in this advertisement.



THE T. L. SMITH COMPANY

3136-B Hadley St., MILWAUKEE, WIS.
1349-B Old Colony Idq., CHICAGO, ILL.

B. F. AFFLECK, NEW PRESIDENT OF UNIVERSAL PORTLAND CEMENT COMPANY.

B. F. Affleck has been elected president of the Universal Portland Cement Company, owned by the United States Steel Corporation, to succeed Edward M. Hagar, whose resignation was recently announced. Mr. Affleck entered the service of the Illinois Steel Company in 1896, and from 1901 to 1903 represented the cement department of the company in the St. Louis territory. When the Universal Portland Cement Company was incorporated in 1906 to take over the cement business of the Illinois Steel Company, he became general sales agent. From a small plant at South Chicago producing 30,000 barrels in 1900, the business has grown steadily and the company now has plants at Chicago and Pittsburgh, with a plant under



construction at Duluth, the combined capacity being about 13,000,000 barrels per annum.

He is vice-president of the Cement Products Exhibition Company, under whose management the annual cement shows have been held in Chicago. He is recognized as the pioneer in promoting the use of concrete as a paving material.

PULVERIZED COAL BURNING

We have perused with great pleasure the article on Pulverized Coal Burning in the Cement Industry by Professor R. C. Carpenter of Cornell University which appeared in the February issue of Cement & Engineering News. We agree with Mr. Carpenter in a great many respects, writes the Bradley Pulverizer Company of Boston, but take exception to the statement made by Mr. Carpenter that the Griffin Mill is objectionable on account of the dust it produces and for your readers' information would state that while the old style 30" Griffin Mill did cause some dust in the grinding room which really was not objectionable due to the fact that the other machinery produced greater quantities, the Giant Griffin Mill which is the latest type of Griffin Mill which we manufacture does not produce this dust.

COOSA CEMENT COMPANY.

On account of a very marked increase in orders the Coosa Portland Cement Company, with a large plant at Ragland, Alabama, has resumed operations, according to an announcement by Paul Chalifoux. The plant was not to have been started until next month. However, the concern received the contract for the cement and gravel of the Jacksonville viaducts, and the quantity is expected to be so great that operations were started without waiting for the expiration of the time.

"We have had in mind some betterments for some time," said Mr. Chalifoux, "but one thing and then another came about, causing delays. However, the improvements we contemplated will be made without further delay and will include additions to our plant of a most advantageous character.

"Our company has been given the Jacksonville viaduct contract, and although we do not as yet know the exact requirement, yet it will be very large. The cement requirements will exceed anything that we have undertaken for some time. Our plant, which was shut down, and which was to continue closed for some weeks yet, has been resumed, and we are consequently feeling exceedingly optimistic. We have orders now under negotiations which will start 1915 off as one of our best years. I am exceedingly optimistic over the situation."

Harry Blanchard, sales manager for the Coosa Portland Cement Company, has returned from Jacksonville, where he successfully handled the negotiations for the viaduct contract.

JEFFREY PULVERIZERS

The Jeffrey Manufacturing Company of Columbus, Ohio, have recently issued a new 48-page Bulletin, No. 147, illustrating and describing the prominent features of their complete line of Swing Hammer Pulverizers, giving full information regarding capacities, speeds, horsepower, general dimensions, etc. More than 1000 of these machines are now in daily operation reducing Limestone, Shale, Gypsum, Clay, Coal, Coke, Ores, Tankage, Bark, Oyster Shells, Rock for Road Top Dressing, and many other materials. A free copy of this bulletin may be obtained by writing to their home office.

LOCOMOTIVE CRANES

Book No. 158 issued by the Link Belt Company of Chicago illustrates and describes their locomotive cranes, paper, 10 $\frac{3}{4}$ "x8 $\frac{3}{4}$ ", 38 pp., illust. The numerous illustrations given in this book show the application of locomotive cranes to a wide range of service and conditions. The crane is driven by steam or electricity, and equipped to operate a grab bucket, hook block, electric lifting magnet, drag scraper bucket, steam shovel dipper and pile driver. Send for a copy of book No. 158 and mention Cement and Engineering News when writing.

BIDS WANTED FOR PUMPING GRAVEL

Rapides Gravel Company, Alexandria, La., announce that they are desirous of letting contract for pumping and screening a minimum of 100,000 cubic yards of loose gravel and sand with a six or eight-inch centrifugal pump. Minimum average of ten cars per day. Height to be pumped above pump center is 35 feet distance; 100 feet and less general average. Distance to be pumped will not exceed 50 feet. Plenty of water. Fuel cheap. Healthy locality. Simply want sand screened from gravel. Sand to go in one railroad car and gravel into another. A very easy and simple proposition to handle.

Sackett

Equipment

Cars, Buckets, Screens
Portable Track, Elevators
Conveyors
Concrete Handling
Machinery, and Spouting

Illustrated in our complete
Catalogue No. 32E

Let it be YOUR
Purchase Guide

Write for Your Copy Today

H. B. Sackett Screen & Chute Co.

Main Office and Shops:

1679 Elston Ave., CHICAGO, ILL.

Branch Warehouse:

187 Medford St., CHARLESTOWN, MASS.



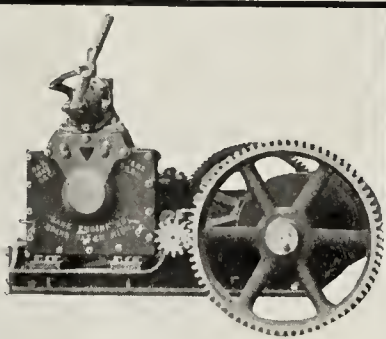
Dake Engine Co.

Grand Haven,
Mich.
U. S. A.

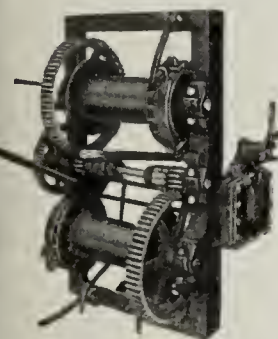
Write for Catalog
and Prices



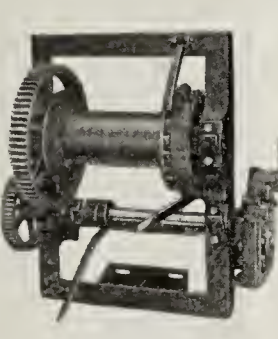
Reversing Steam or
Air Motor



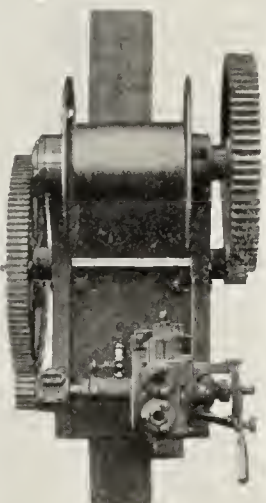
Swinging Engine



Double Drum Motor
Crab



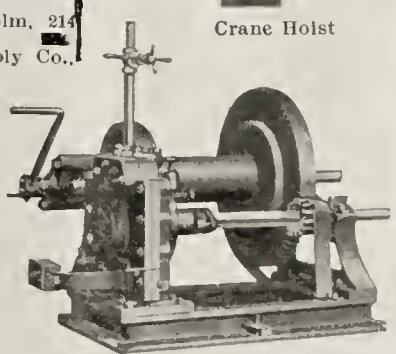
Single Drum Motor
Crab



Crane Hoist



Direct-Connected Centrifugal Pump



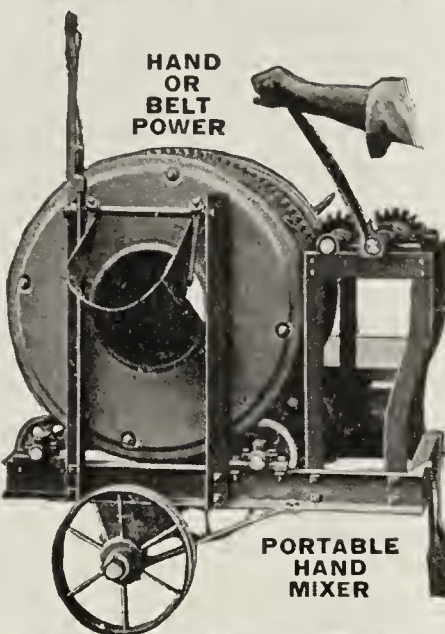
Single Drum Friction Hoist

AGENTS:
Boston—H. L. Bond Co.
New York—H. L. Drullard, 30
Church St.
Chicago—J. E. Chisholm, 214
Fisher Bldg.
The Queen City Supply Co.,
Cincinnati, Ohio.

Ford's System Adopted In Packard Mixer Factory Mixer Prices Smashed

THE BIG HIT

AT
CEMENT SHOW



HAND
OR
BELT
POWER

PORTABLE
HAND
MIXER

OWNERS SAY:

S. W. Hill & Son, Minn., says:
Mixes fast and thoroughly. Ev-
erybody likes the mixer. Batch
hopper measures fine, etc.

W. H. Borough, Ohio, says: We
investigated all mixers; glad we
bought the Packard. 3 H. P. en-
gine a success. Cut mixing cost
30%, etc.

HUNDREDS OF OTHER LET-
TERS, NAMES, ADDRESSES,
ETC. ON APPLICATION.

**FIVE-FOOT
CAPACITY—
UP TO 65
YARDS DAILY**

**SAME MIXING
ACTION AS
\$2000 PAVER**

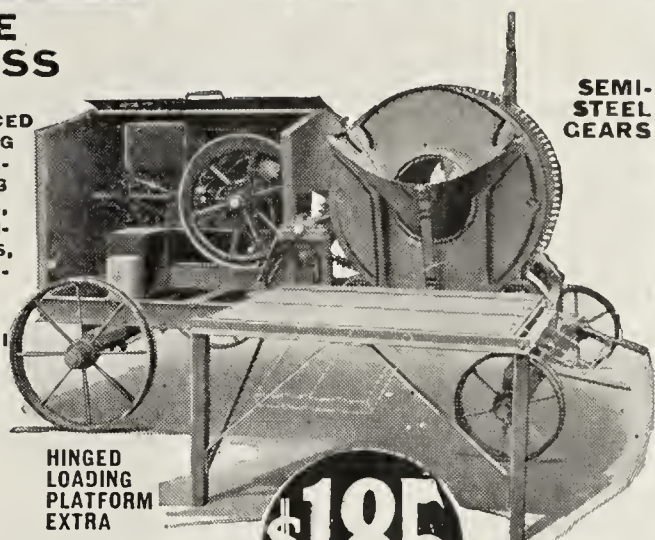
SPEED QUALITY
Packard
HAND AND POWER MIXER.

STURDY LOW
CHARGING
POWER MIXER

VOLUME BUSINESS

OUR EXPERIENCED
WORKMEN USING
SPECIAL MA-
CHINERY, JIGS
AND TEMPLATES,
TURN OUT HUN-
DREDS OF PARTS,
FAST BUT ACCU-
RATELY.

MIXER BUYERS
PROFIT BY OUR
REDUCED FAC-
TORY COSTS.
AT LOWEST
PRICES EVER
MADE YOU GET
A COMPACT
STEEL MIXER,
WITH A 3 H. P.
ENGINE.



SEMI-
STEEL
GEARS

HINGED
LOADING
PLATFORM
EXTRA

COMPARE SIZE ENGINES
WITH OTHERS.

\$275 Steel Trucks-
3 H. P. Engine-
Steel Housing-
All Steel Loader.

50 MORE BATCHES
A DAY WITH
SAME CREW



ON STEEL TRUCKS, 3 H. P. EN-
GINE, STEEL HOUSING, LOW
BARROW HOPPER.
READY TO OPERATE.

\$185

**BUYS
MIXER**

MEASURING BATCH
HOPPER OR HOISTING AT-
TACHMENT CAN BE PUT
ON ABOVE MACHINE AT
SMALL EXTRA COST.

FULLY GUARANTEED—
SOLD ON TRIAL—CASH
OR EASY PAYMENTS.

WRITE FOR OUR
SPECIAL PROPO-
SITION.

STOCKS CAR-
RIED IN ALL
PRINCIPAL
CITIES.

CONTRACTORS MACHINERY CO.
130 ELEVENTH ST., KEOKUK, IOWA

DIXIE CEMENT COMPANY

Stockholders and directors of the Dixie Portland Cement Co., with offices at Chattanooga, Tenn., and plant at Richard City, Tenn., held their annual meeting in Chattanooga in January. President Richard Hardy's financial statement was approved and the administration of the business in 1914 commended. The bulk of business, while not as large as in 1913, was considered as satisfactory in light of the commercial condition which affected every line of business.

The following directors were elected: Richard Hardy, T. R. Preston, Wellington Barnes, Capt. H. S. Chamberlain and C. E. James, of Chattanooga; George W. Millen and Alex I. McLeod, of Detroit; T. G. Garrett and Fielding H. Yost, of Nashville; Leigh Hunt, of Kansas City; and Dr. J. P. Gillen, of South Pittsburg, Tenn. The directors elected Mr. Hardy as president, Mr. Preston as vice-president, Mr. Barnes as treasurer, and George Killian as secretary.

The executive committee comprises Messrs. Preston, Barnes, Chamberlain, McLeod and Millen.

CHAIN BELT CATALOG.

The Chain Belt Company, Eleventh avenue, Milwaukee, Wis., have just issued their new General Catalog, No. 56, which they will gladly send, gratis, to any of the readers of Cement and Engineering News. Bound in cloth, 6x9 inches, profusely illustrated, and contains 300 pages. The catalog itself is a worthy



specimen of the printer's art—gotten up in rare good style. A complete treatment of elevating and conveying machinery, featuring Griplock (malleable) and Chabelco (all-steel) chain belts, sprocket wheels, transmission machinery, elevator and conveyor appurtenances. As an introductory, a few facts about the Chain Belt Company and illustrations picturing important installations of elevating and conveying machinery are given. Tables and general descriptions follow each classification in the book.

A NEW DERRICK FOR BUILDERS

A new portable one-ton stiff-leg derrick so arranged that it may be operated by hand, horse, or other power, has just been marketed by the Sasgen Derrick Co., 2052 North Racine avenue, Chicago, Ill. (Write for their catalog No. 15.) The simplicity of its construction allows it to be taken apart or set up quite easily, and the legs and sills may be swung to any angle desired. Fig. 13 of the accompanying illustration gives the reader an idea of the machine as it appears when set up. It is supplied with a length of boom averaging from 12 to 20 ft., and sills and legs 4x6 in. The mast and boom are in two pieces of 2 1/4 x 6 in. The derrick is equipped with steel fittings, including the double drum geared winch. It is especially strong and light, and an 18 ft. boom will set every stone from 500-2500 lbs., on a 30-ft. front one story without moving the derrick. The boom may be used separately as a tower boom, in which case two extra fittings can be furnished by the company. Catalog No. 15 will be sent

to interested readers of Cement & Engineering News. It contains much information on derrick construction, each device is well illustrated, and accompanied by prices and descriptions explaining operations.



Sasgen Derrick.

HYATT ROLLER BEARINGS USED IN BOSS MIXERS A WONDERFUL SUCCESS

Cement, grit and sand, combined with water, has been one of the worse enemies of a concrete mixer, on account of cutting our bearings and continual re-babbitting, a problem for both the contractors and the manufacturers for years.

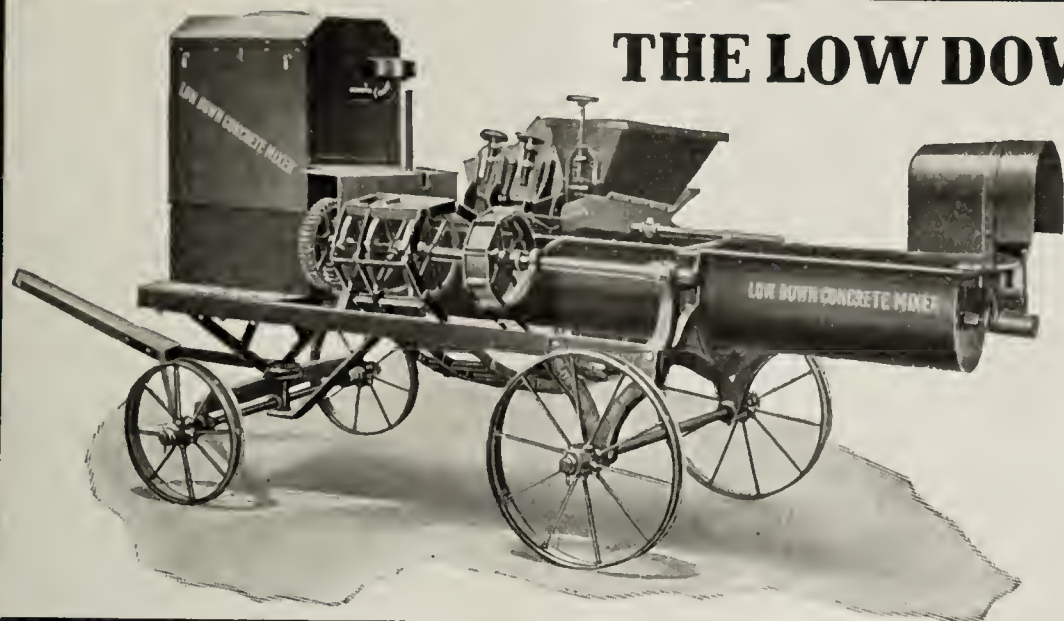
The American Cement Machine Co., after consulting with the chief engineers of two of the very largest traction engine concerns, adopted the only bearing they had found would stand the wear and tear—viz., Hyatt Roller Bearings. This happened more than a year ago, and exhaustive tests since then have proven that Hyatt Roller Bearings on Boss Mixers, which run in oil, incased in special dust and grit proof boxes,



saves 17 per cent of the power and easily 70 per cent of the oil bill, and has the big advantage of requiring oiling only once a week. The bearing used is known as the Flexible Heavy Duty type, which absorbs the shocks adding life to the mixer.

Realizing that the public, and especially the engineers, were wanting a popular priced one full sack sized mixer, this concern has brought out a quality machine as can be judged by the costly successful bearings. Novo engines, all steel construction. Because of their wonderful manufacturing power and

THE LOW DOWN FORCE FEED MIXER



has a capacity of from 4 to 12 cu. yards an hour with a forced feed and stroke off measurement different from all others. It gives absolutely perfect proportions whether the materials are wet or dry. Cannot clog. You can set and lock the feed gates so there will be no variation.

Few parts, open-to-view mechanism and low down hoppers make this mixer economical in operation and upkeep. Feed can be changed without stopping the machine. Safety friction clutch enables you to stop or start the machine without stopping the engine. Construction perfect. Price remarkably low.

Find out more of the Low Down's good features. Send for Catalog "B," which gives detailed information. Mention Cement & Engineering News when writing.

ELITE MFG. CO., Ashland, Ohio

The HARDING MORTAR MIXER Successfully Mixes Hard Wall Plaster and Brick Mortar

The sensation of the Chicago and Omaha Cement Shows was the rapid, successful and thorough mixing of hard wall plaster with hair and fibre, lime mortar and Portland cement with the Harding Mortar Mixer. We mixed the actual material for the "show me" type of contractor, and made good with him.

With this Mixer you save the wages of one to six laborers on every job. One laborer can do the work of four; two men can do the work of eight.

You save one-quarter of your material bill. Thorough mixing permits use of more sand.

You get perfect mortar, impossible to get mixing by hand. Machine mixed mortar is uniform. It spreads easier, hangs together better and sets harder.

You make a good mortar man out of any laborer.

You have Mortar all the time, and exact amount to last you until quitting time. The machine is fast. A batch can be dropped out in ten times the time the material could be mixed in the box. Write us for proof from Contractors and details now. Sold on Free Trial.

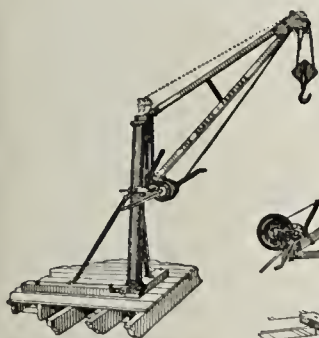
Architects are beginning to specify machine mixed mortar. An exceptional proposition for representatives in unoccupied territory.

The Mortar Mixer Corporation

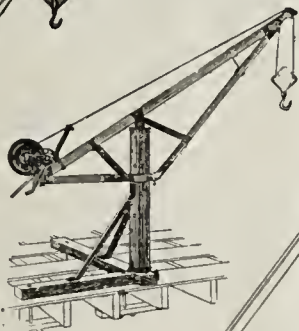
700 Washington St.,

Iowa City, Iowa

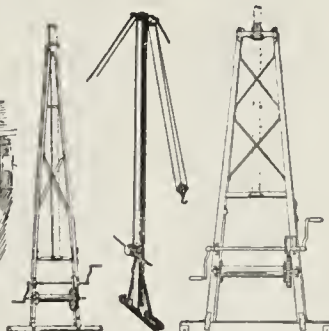
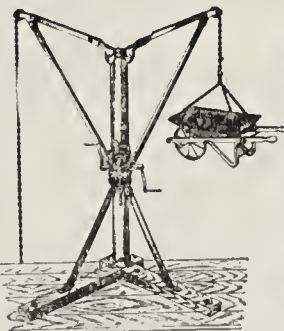
MOST COMPLETE LINE OF BUILDERS' DERRICKS



Sasgen's is the oldest derrick house in the country. We make the strongest, best and most reasonable price derricks.



STIFF
LEGGED
DERRICK



We manufacture Steel and Wood Circle Swing Builders' Derricks, hand and power, Pole-Setter, "A" Frame, Double Boom Wheelbarrows, Stiff Legged and Guy Line Derricks, Single and Double Drum Geared Winches, Blocks, etc.

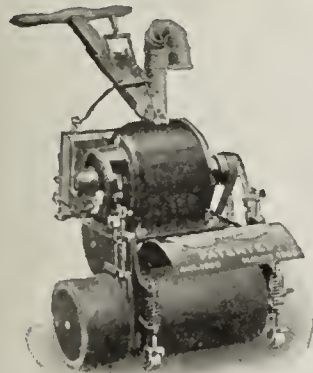
SASGEN DERRICK COMPANY,

2052 North Racine Avenue, CHICAGO

WRITE FOR CATALOG No. 15

TEST AND TRY BEFORE YOU BUY

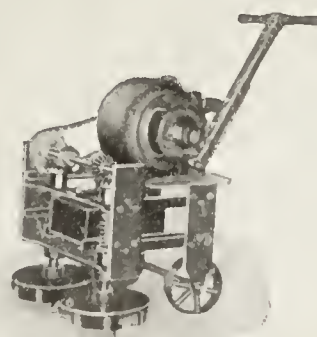
The Schlueter Rapid Floor Surfacer



The Schlueter BALL BEARING electric floor surfacing machines for mosaic, marble, composition and wood floors are the most simple constructed machines on the market. Direct chain drive AUTOMATIC DUST COLLECTORS. No gears or clutches to wear. Made in various styles.

OVER 5,000 IN USE ALL OVER THE WORLD

Send for prices and free trial proposition

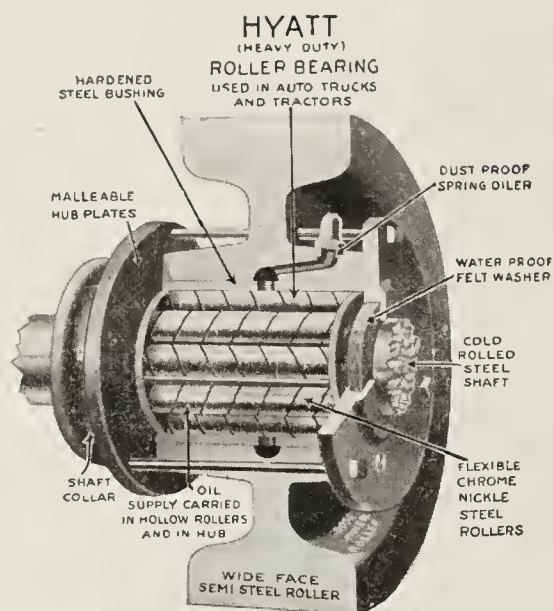


THE M. L. SCHLUETER CO.

225 W. Illinois Street, CHICAGO

big factory facilities, they have succeeded in bringing out a full sack machine that they can sell at a price which you formerly paid for a small mixer that required splitting sacks. Their immense factory is working night and day shifts, and their business of January of the 1915 season had increased 800 per cent over the same month last year, which proves the tremendous demand for the Boss Mixers.

The 6 ft. Famous Little Boss Mixer has found hundreds of friends amongst the carpenters, silo and general contractors, who wanted a combination mixer and hoisting engine for their smaller jobs. This mixer can also be equipped with batch hopper or the low charging barrow hopper with hinged loading platform. The extra hoist, which operates independently of the mixer, yet is run by the same engine, is shown in the accompanying photograph at work on a large job in Jersey City.



The American Cement Machine Co., 130 Eleventh Street, Keokuk, Ia., has branches in all the large cities of the United States and Canada, where it carries stock for prompt shipment, and we will suggest that every contractor get a copy of the new complete specifications and prices on concrete mixers and the New Mandt Mortar and Plaster Mixer.

CENTRIFUGAL SAND PUMPS

The Erie Pump & Equipment Company of Erie, Pa. has just issued their Bulletin No. C30 containing 32 pages describing and illustrating Erie sand and gravel dredging pumps, a copy of which they will gladly send to any of the readers of Cement & Engineering News.

These are centrifugal pumps of strong construction, with a heavy, specially designed impeller with as large passages as possible. These pumps are used, not only for producing sand and gravel for commercial purposes, but also for pumping a great variety of fluids and even semi-fluid substances, and for contractors' uses. These pumps will handle large quantities of water in excavation work and become especially valuable when there is a considerable percentage of solids. The pumps are built of iron or of steel, the latter costing from 40 to 60 per cent more than the former. They are built both right and left hand, with steam or electric driving power. The catalog also includes pump and pipe fittings, such as suction hose, flexible ball joints, riveted pipe, gaskets, flanges, etc. The bulletin is illustrated with cuts of the different pumps and parts, and with photographs showing them in operation and the character of the work they do.

CONCRETE FENCE POSTS.

Concrete fence posts are far better than wooden and cost less. They get stronger with age. Never

rot, rust, nor burn. Stand straight and do not heave easily. Each post is a lightning arrester. They beautify the landscape and enhance the value of the farm. Have been adopted by leading railroads, U. S. Government, State Experiment Stations and progressive farmers everywhere. Note what the U. S. Department of Agriculture has to say as to the comparative advantages of concrete and wooden posts. This is taken from Farmers' Bulletin 403, issued May 21, 1910:

"As a material for the construction of fence posts, concrete has not only very few of the disadvantages and practically all of the advantages of wooden posts; but it is also superior to timber in some respects. In the first cost concrete posts may be more or less expensive than the best wooden posts, according to the locality. This depends upon the timber supply, the deposits of gravel and rock, and the skill exercised by the person making the concrete posts.

If manufactured as usual and cured for three months, concrete posts are as good as the best wooden posts of the same size. After three years' service wooden posts possess only from one-third to one-half of their original strength, whereas, concrete grows stronger with age and needs no repairs, for neither weather nor fire injures it. Under ordinary circumstances good concrete posts will last forever; and even if a few, in the course of years should be broken by unusual strains it is cheaper to replace these than to replace an entire fence of decayed wooden posts with posts of material with the same lack of durability.

Concrete posts are attractive in appearance because of their uniformity of size and color, and because of their durability, they effect a saving in giving greater life to the fencing material used, so that the permanent value of the property is increased."

One of the conclusions reached by the Committee on Signs, Fences and Crossings of the American Railway Engineering Association is as follows:

"Concrete posts are practical, economical and a suitable substitute for wood."

The W. E. Dunn Mfg. Co., 4139 Fillmore Street, Chicago, manufacture concrete fence post molds and they will be glad to send any of our readers their catalog and prices.

PORTABLE ROTARY SCREEN

A rotary screen designed to be readily portable and to replace hand screening is shown in the accompanying illustration.

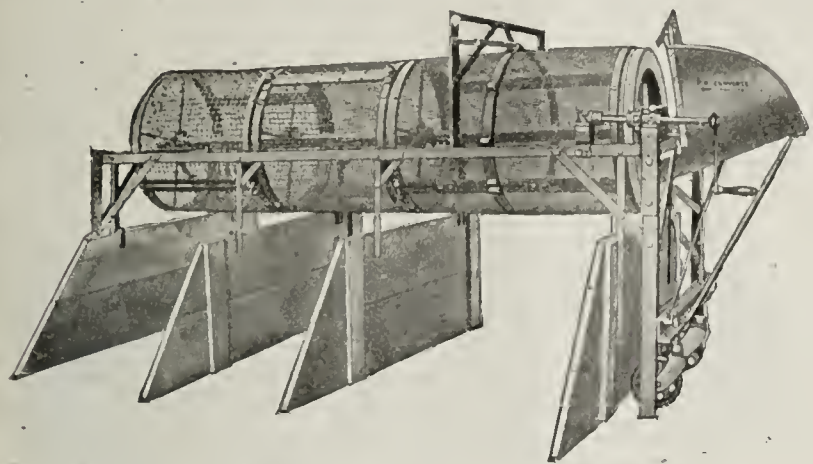
The machine consists of a cylindrical screen of heavy wire cloth, arranged to be rotated either by hand or by power, mounted on a steel frame equipped with four wheels, allowing the screen to be moved from place to place on the work. The machine is made in several sizes. The one shown herewith is 7 feet long and 30 inches in diameter.

The cylinder is made up of three sections, each fitted with a screen of different mesh. Each section is composed of two half-sections, which are removable and interchangeable to allow the use of any desired combination of screens. Bins for holding the separate sizes of stone may be made by means of board partitions, which are set up transversely under the cylinder, one at each end and one at each of the two intermediate points between screens of different sizes. These partitions are not furnished with the machine.

An automatic cleaner to prevent the clogging of the screen is attached to the frame near the charging end. As shown in the illustration, this consists of a steel frame carrying a hammer suspended over the top of the screen and operated by means of a steel band encircling the cylinder. This band carries sprockets

which, as the band revolves with the screen, raise the hammer several inches as they pass under it, allowing it to fall back and jar the fine particles out of the meshes.

For hand operating a crank is provided at the charging end of the machine. If it is desired to run the screen by power the crank is removed and replaced by a pulley. A chain transmits the motion from a small sprocket on the crank shaft to a larger one on the main shaft.



Motor Driven or Hand Power Rotary Screen.

One or two men may be used to operate the screen. In the former case the operator alternately fills the charging hopper and turns the crank. Two men usually run the machine, one shoveling material and one turning the crank. When so operated, it is claimed, dry material can be screened as fast as one man can shovel.

The machine is made by the H. B. Sackett Company, 1679 Elston Avenue, Chicago. Write them for circular, prices and information.

CONCRETE STONE MANUFACTURE

All data pertaining to the manufacture of concrete stone in its many uses as building block, ornamental stone, tile, facing or statuary so far had to be looked up by the public or engineer interested in the subject. In the past ten years' volumes of our most important technical magazines. It will, therefore, interest the reader to learn, that Harvey Whipple, the managing editor of Concrete-Cement Age conceived the idea to gather all this information and to present it to the public in a comprehensive book, richly illustrated, which deals with every phase of the subject, from the manufacturer's standpoint as well as from the architect's or user's.

Moreover, a lengthy chapter describes in detail a large number of plants manufacturing concrete stone. This will especially interest prospective manufacturers of artificial stone or parties engaged in the business whose plants are not working as economically as desired. Price of book \$1.00 postpaid.

MOST VALUABLE BOOK ON WATER-PROOFING

The Sandusky Portland Cement Co., Sandusky, Ohio, have recently favored this office with their Medusa Waterproofing catalog which is by far the handsomest book they have ever issued on this subject, containing 32 pages handsomely illustrated. From cover to cover this little book has much information as to tests, reports of engineers and others who have used Medusa Waterproofing and cement products. A copy of this catalog may be had for the asking.

You Can Drive Staples Into this Cement Post

If you are going into the post business, why not commence on a *business-like basis*? Equip your plant with our molds, make your posts *wet*—make this a *real business*, not a side line. No *experts* necessary nor a large force of men required to run a *1,000 mold plant*, for *one man can make 200 posts in 10 hours* with material prepared.

Here's a real live wire. The best in the cement field today, as proved by Staple Post plants all over the country.

Yes, this is the STAPLE CONCRETE POST!

You Fasten the Fence Like It Were a WOODEN Post!

Furthermore, our staple-receiving composition is as durable as concrete—no wood. Does not add $\frac{1}{10}$ cent to cost of post. Holds staples, regardless of age.

This in Itself is Enough

to justify the reputation the Staple Post has earned of being the only *real* substitute for wood.

But Besides

The *reinforcement* is the strongest known—the rods are firmly held *near the corners*.

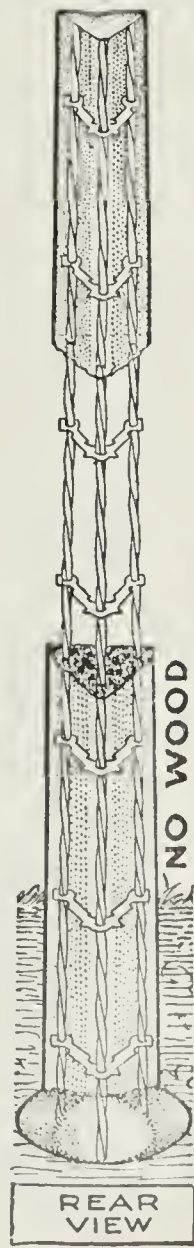
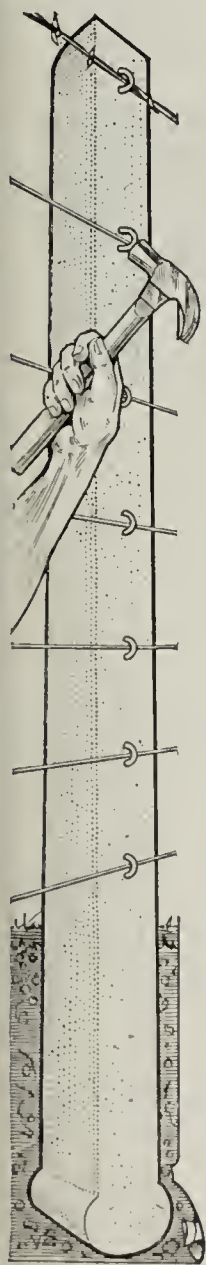
The weight, 50 lbs., makes the Staple Post the lightest, effecting a very great saving in material, handling and freight.

Our system has been so carefully worked out that the initial cost to manufacture—the only cost—is surprisingly low.

Write Us—We Want to Tell You About a REAL BUSINESS

STAPLE POST MOLD CO.

453 W. HOME STREET
WESTERVILLE - OHIO



CONCRETE SILOS

The economy of storing silage these days is appealing very strongly to every farmer. Two and one-half to three tons of silage is equivalent in feeding value to a ton of hay and may be stored in one-half to two-thirds the space occupied by the latter. Silage keeps your stock thrifty and growing all winter, produces fat beef more cheaply than does dry feed, and enables cows to produce milk and butter more economically.

We here illustrate the monolithic type of silo, recently constructed by Contractor F. E. Mohns, on the farm of W. F. Pelley, near Rockford, Ill. These



Silo on Farm of W. F. Pelley.

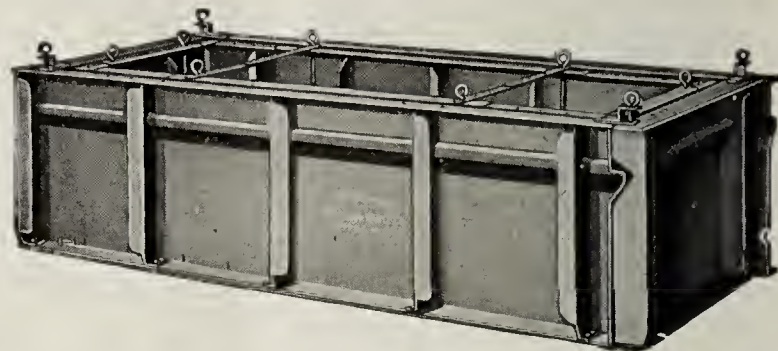
silos have the chute and roof with the silo proper cast all in one piece, with Polk forms. Like others built in the vicinity of Rockford, these silos present a substantial form of construction and add an air of thrift and progressiveness to the surroundings. The uniform color effect is secured by the use of smooth sheet metal forms. Contractor F. E. Mohns is also building a concrete silo on Mayor Bennett's farm at Davis Junction, Ill., which is also of the monolithic type.

The bases of these silos were made about 9 inches in thickness, standing on a concrete footing built from 2 to 3 feet wide, according to height of the silo. The walls proper are 6 inches in thickness. The interior diameter of the four silos recently built is 12 feet and they vary in height from 39 feet to 45 feet, the concrete chute having been cast at the same time as the walls. The forms were lifted each day and the concrete roof cast immediately after the walls were finished. The reinforcing rods extend from the walls up to the roof, meeting the reinforcing of roof proper.

The mix varied somewhat according to the weather conditions, but in general 1 part Medusa Portland Cement, 2 parts sand and 4 parts gravel were used, thoroughly mixed, and poured into the forms when of the proper wet consistency to pour. Steel forms for building monolithic concrete silos are manufactured by the Conklin Construction Co., 430 Main Street, Hartford, Mich., and also by Polk-Genung Polk Co., Fort Branch, Ind. Write them for further particulars and prices.

The Burial Vault Business

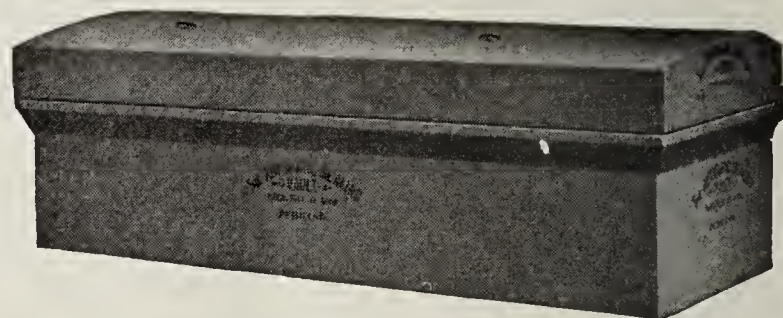
THERE'S no joke about this business. It's sane, solid and sensible. You needn't be ashamed to go into it. You can get business men to back you, because from the very nature of the article a demand for it is increasing right along with the increase in population.



The Adjustable Mold

You can operate this business in connection with a block, brick, tile or post plant, or you can operate it independently. The extent of the vault end of your business depends entirely upon your own enterprise.

Some men first get the idea that you have to peddle vaults at funerals, which naturally stops them from further investigation, but this isn't the right idea at all. You simply work through the undertaker by furnishing him a price that he can sell it for and still enable you both to make a good profit. *CONCRETE* is the ideal vault material—but *ALL* concrete vaults without our patented seal are not a success.



The Vault in Seven Sizes from Above Molds

This much is *CERTAIN*—and a man with very little capital and average common sense and a bit of business energy can start making vaults on a small scale and sell them and make more and sell more until he has a big, well-established money-making business worked up.

BUT—HE MUST START RIGHT—He must be able to make good vaults, at low factory cost—vaults that undertakers would push—vaults that people will demand.

OUR MOLDS are simple, designed so they are adjustable to make 7 standard sizes of vaults, and when the concrete is poured into this mold and has set sufficiently, the molds can be removed, which leaves a smooth surface without the mark of a rivet head showing up.

We sell you the molds outright—no blue sky. You buy the molds at a fair price and they belong to you. But we don't stop there—we help you get started—help you turn out first-class vaults—show you the knacks and methods to get the undertaker lined up.

We'd like to hear from the right kind of men now—the investment required is small, the returns large.

OUR BIG BOOK explains all. Fill out the coupon and mail today.

The Automatic Sealing Vault Co.,
203 East River St., Peru, Indiana.

Gentlemen:—Send me your book about your vault molds and the product they turn out, and what the opportunities are.

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TURN NIGHT INTO DAY**

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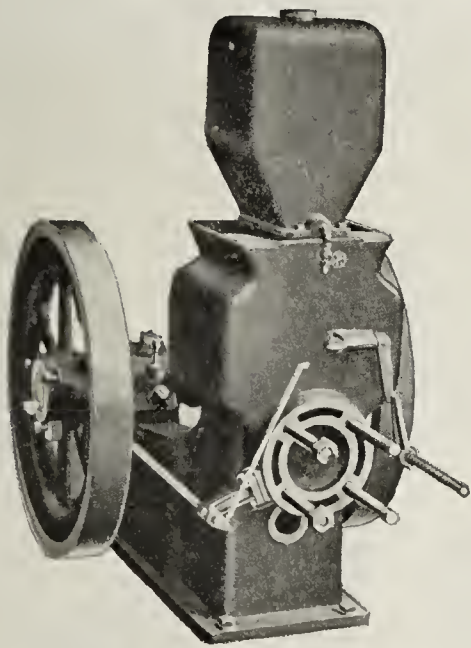
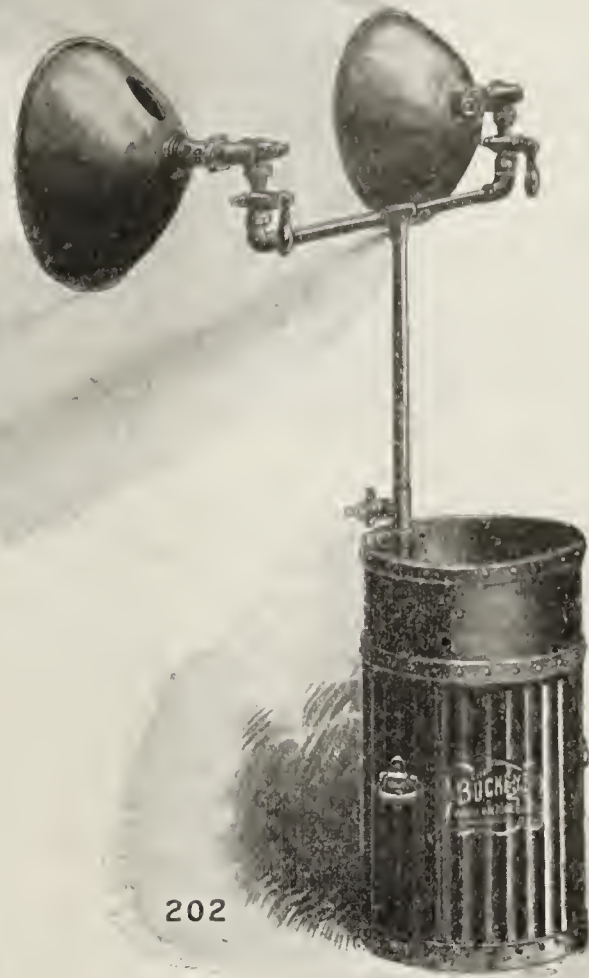
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No Batteries	No Carburetors	No Hot Tubes
No Magnetos	No Torches	No Hot Balls
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Users and owners should know about this efficient and fuel-saving engine. Your correspondence is solicited.

The A. M. Castle Engineering Co., Inc.
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Stop Shoveling Your Profits Away

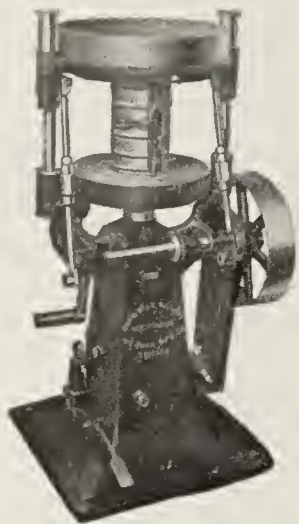


Get the Time-Saving, Substantial, Reliable, Economical Van Duzen Mixer, with or without side loader, used by hundreds of large and small contractors. Capacity 50 to 80 yards per day. Both the Price and Cost of Operation will surprise you.

Manufactured under Basic U. S. Letters Patent
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Our catalog fully describes these machines

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The Reason Why You Are Not Making Cement Drain Tile Is Because You Have Not Yet Investigated Its Possibilities

The superiority of cement tile for drainage purposes is **known**; there is no competition in quality or price. For this reason its future use is assured, as well as its present use.

The cement drain tile business does **not** require a large investment—nor skilled labor—nor hard selling. A few hundred dollars will start you right; you can use unskilled labor; you can sell all the tile you manufacture without any difficulty.

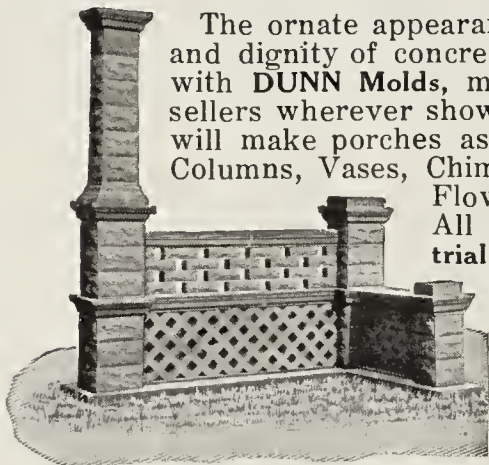
And we are prepared to guarantee profits ranging from **\$230 to \$800** a month.

Ask us today for printed proof of comparative costs and profits in making tile; we send this information free upon request.

Dunn equipment is sold on **15 days' trial**; write for the tile equipment catalog. Price of Dunn No. 1 Tile Machine.....

\$165

Concrete Porches Pay a Bigger Profit Than You Think.



The ornate appearance, permanence and dignity of concrete porches made with **DUNN Molds**, make them ready sellers wherever shown. Dunn Molds will make porches as illustrated, also Columns, Vases, Chimneys, Balusters; Flower Boxes, etc. All sold on **15 days' trial**.

Write for Porch Mold catalog today. Price of outfit for making porch as shown,

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Don't Tamp Sewer Pipe—POUR IT!

Tamping a semi-dry mixture, to make large drain tile and sewer pipe, is not only slow, troublesome and costly—but **unnecessary**. Pouring a wet mixture into **DUNN Molds**, besides being the most efficient method, assures the strongest product. Reduces manufacturing costs, too, and increases the profits.

Dunn Molds permit the manufacture of all size pipe, from 6 to 36 inches in diameter. All sold on **15 days' trial**; Pipe Mold catalog gives full descriptions and prices, ask for a copy. Price of 12-inch mold.....

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Pat's No. 842262 and 782700

Here's Mixer Value Out of the Ordinary

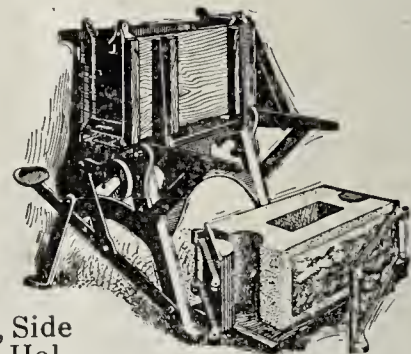
Let **facts**—not claims—influence your buying judgment. You buy concrete mixers because of what they **are**, not because of what they are claimed to be. To learn about the Dunn construction is to learn the reasons why a **DUNN Mixer** is the mixer you have waited for.

Dunn Mixers have four mixing blades and extra long drums, giving them the highest possible mixing efficiency. The convenient loading height and the **power discharge** feature, save labor. Their capacity—a batch a minute—is assurance of ample speed. The one-piece hollow yoke makes the operation almost noiseless. The all steel and iron construction is evidence of long life.

Write today for catalog describing all styles and sizes. We sell on **15 days' trial**. Prices.....

\$67.50 to \$224

Use Three Block Machines—but Buy only ONE



To make Face Down, Side Face and Two-Piece Hollow Wall Cement Blocks **usually** requires three machines. But one **DUNN Combination Cement Block Machine** will make all three types. Saves two-thirds the usual investment.

By using a wet mixture it saves considerable tamping, and makes a stronger block. And a special off-bearing system protects each block against breakage. Capacity, 150 blocks daily.

Sold on **15 days' trial**. Write for Block Machine catalog. Price.....

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The Concrete Fence Posts that Sell the Quickest

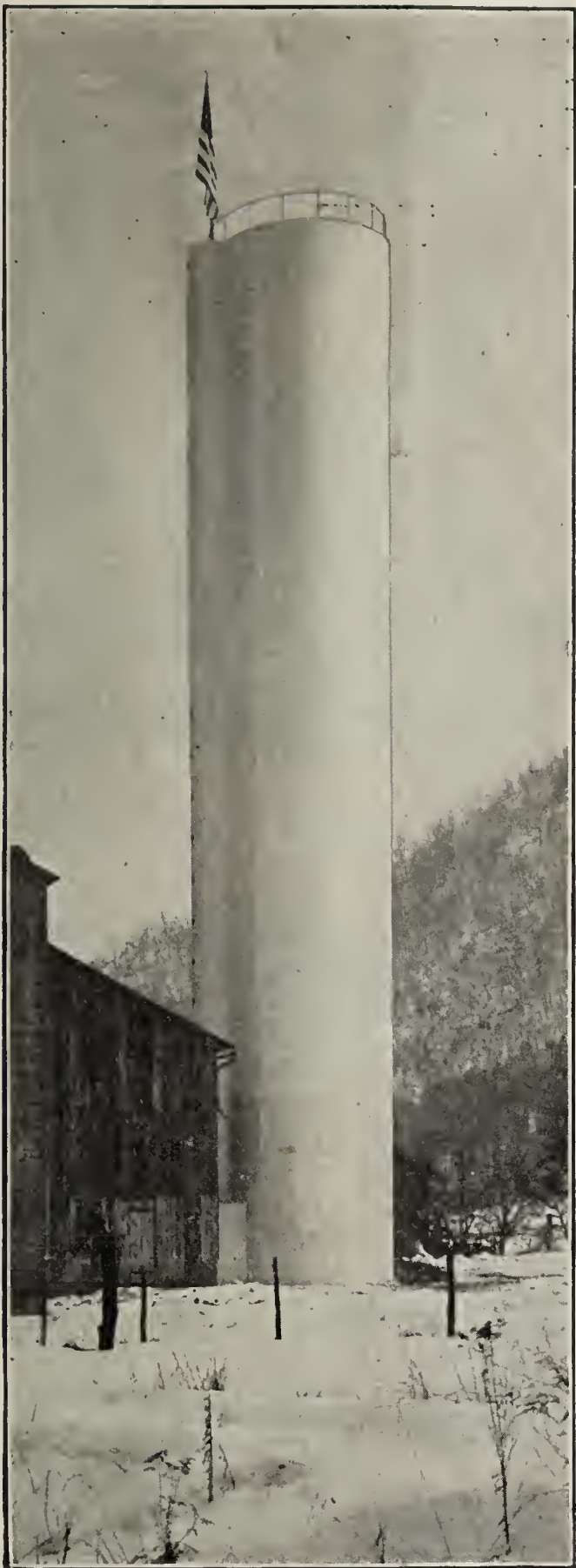
Are those of high quality and moderate price. These are the kind that **DUNN Fence Post Molds** made. The Dunn system enables quick and economical manufacturing. Tamping is eliminated by our special **Vibratory Base** which compacts each post to uniform density and firmness. Made in batteries of four and ten. Sold on **15 days' trial**. Price of 4-mold battery.....

\$12.50



W. E. Dunn Mfg. Co.
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A 16' x 108' SILO BY THE

POLK SYSTEM

Built by Quality Farm Products Co.
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The real "golden opportunity" for the concrete man is in the field of silo building. Ask anyone who is in touch with modern agriculture.

Concrete silo building becomes easy and highly profitable when the proper equipment is at hand. The best possible equipment is described in a little book that we have for you.

Polk-Genung-Polk Co.
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The Perfection Concrete Stave Silo

made by the "wet mix" system.

The staves are so formed that any diameter of silo can be built. The staves are made by the "wet mix" system by casting them in our steel moulds. The product is a strong, non-porous, water proof stave, made with common labor and right at the "silo job." No factory required; you save railroad freight, loading and breakage of staves.

Our "All-Steel Door-System"

is ideal and just what the silo feeder demands. Doors continuous from bottom to top of silo; size 24x25 inches in the clear.

Concrete Workers

get into the Concrete Stave Silo business. It is a growing and permanent business, and our system makes you big Profits.

Get the best form of construction—one that can not be out classed later.

Get the "Perfection."

Write us to-day for our liberal proposition to supply you with our steel moulds and exclusive territory. Let us give you facts and figures on ease of erection, permanency of construction and low cost and big

Profits

to you. You will be highly interested. Write to-day.

Perfection Concrete Stave Silo Co.

506 Clapp Building

DES MOINES, IOWA

MONEY FIRST

It would be preposterous to make a statement of this kind if we were unable to support it. Money appeals to the business man; it's attractive, it's what we



are all working for, and if our proposition is a worthy one there can be no higher calling than the making of money legitimately. Some men work for a dollar a day, others for twenty-five dollars a day—the difference being just twenty-four dollars. The power and influence of the twenty-five-dollar man is greatly enhanced, and he ought to be just that much better fitted for doing his part of the world's work. All of this presupposes that what we have to offer in quality or merit backs up the statement. If we have worked out a system and are able to provide the equipment that will convince the Cement Contractor that he can make \$50.00 a day by the use of the **Conklin Monolithic Silo Molds** where heretofore he has been able to make but \$10.00, it shows plainly that we can make five blades of grass

grow where but one grew before. We can increase his efficiency five times.

To any one interested, we will prove to their satisfaction that we can do that and more. We start you in a paying business with a small investment. May we prove it to you? Write for Catalogue.

CONKLIN CONSTRUCTION COMPANY
430 Main Street, Hartford, Michigan



REDUCE THE COST OF

Operation and Maintenance

With a Negley Excavator

**One
Machine
FOR
Every Use**



**Dumps
AT
Either End
OF THE
Cable-Way**

THE DISCHARGE OF MATERIAL IS CONTROLLABLE

FAST OR SLOW AT WILL

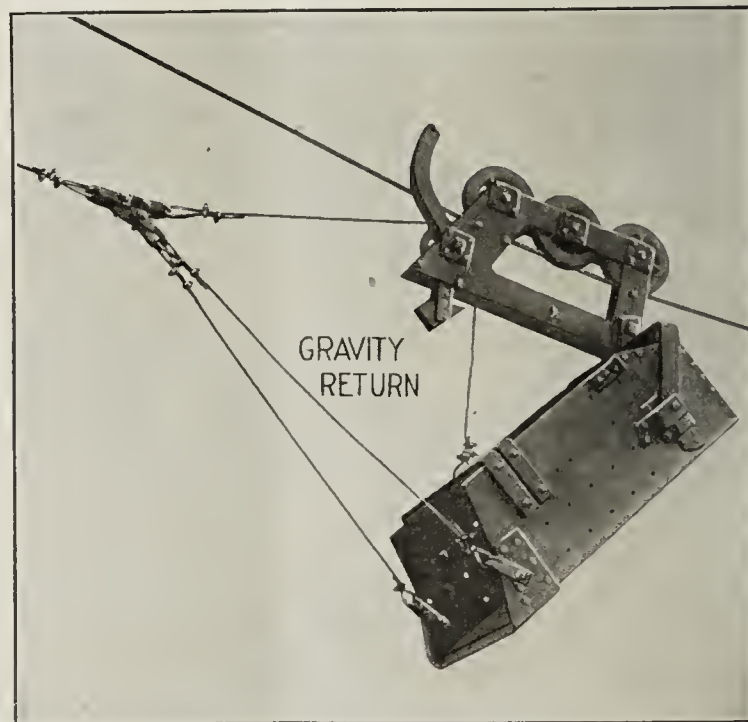
SMALL CLEARANCE GIVES INCREASED STORAGE

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THE FIRST TRUE WHITE PORTLAND EVER MANUFACTURED

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The U. S. Government has used Medusa White in many Post Offices and other buildings, which should be conclusive evidence of its high quality. It is guaranteed to be a high-testing Portland passing standard specifications. Give Medusa a trial and be convinced of its superior quality.

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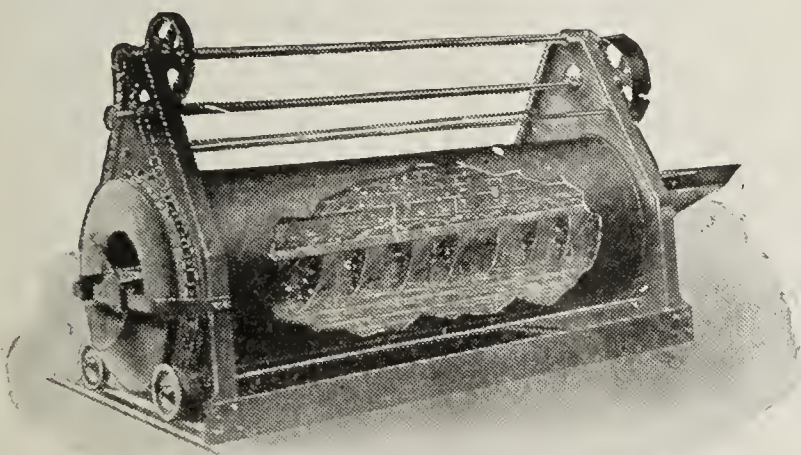
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& COMPANY**
PHILADELPHIA, PA.

Is Your Material Clean?

If Not, Investigate

THE STOCKER WASHER



*It washes and screens in
one operation*

**STOCKER CONCRETE MATERIAL
WASHER CO., Highland, Illinois**



Long Handled
Cement Finishing
Tools
Operated
Automatically

One Man With The Double Action Cement Tools Can Do the Work of Five

in a given time with old style finishing tools—
which means a SAVING of EIGHTY PER CENT
OF THE FINISHING COST OF YOUR WORK.

All Our Finishing Tools Work Automatically

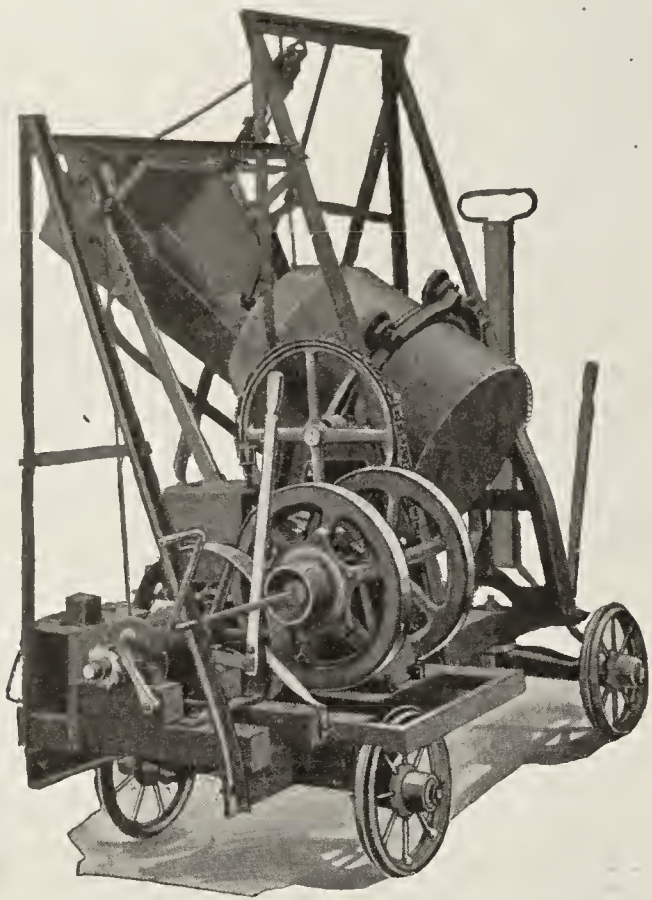
Finishing Trowel has 24-inch blade; 16-inch
trowel with jointer attachment, edger and float.

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Send For Catalog and Prices

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DUGGER, IND.

A Mixer—Not a Separator



The BIG BOSS Portable Concrete Mixing Plant

THIS mixer uses a new and correct construction that positively assures the absolute mixing of every particle of material placed in the drum. Contractors have found this machine to be the most efficient and economical. Built to give service—built for maximum capacity—built to make friends.

These mixers can be furnished without loading attachment, and for hand or belt power.

Manufacturers of a complete line of Cement Machinery, Cement Mixers, Cement Block Machines, Brick Machines, and a large variety of special molds for Porch and Chimney work.

The J. B. Foote Foundry Co., Fredericktown, O., U. S. A.

LITTLE GIANT MIXER

Our Model A, shown herewith, is the most practical Hand Power Mixer on the market. Its blend is perfect and will stand the closest inspection. Its capacity depends upon the power at the crank. A man can turn out from 3 to 5 yards per hour. An engine will double this capacity. We can furnish engines also.

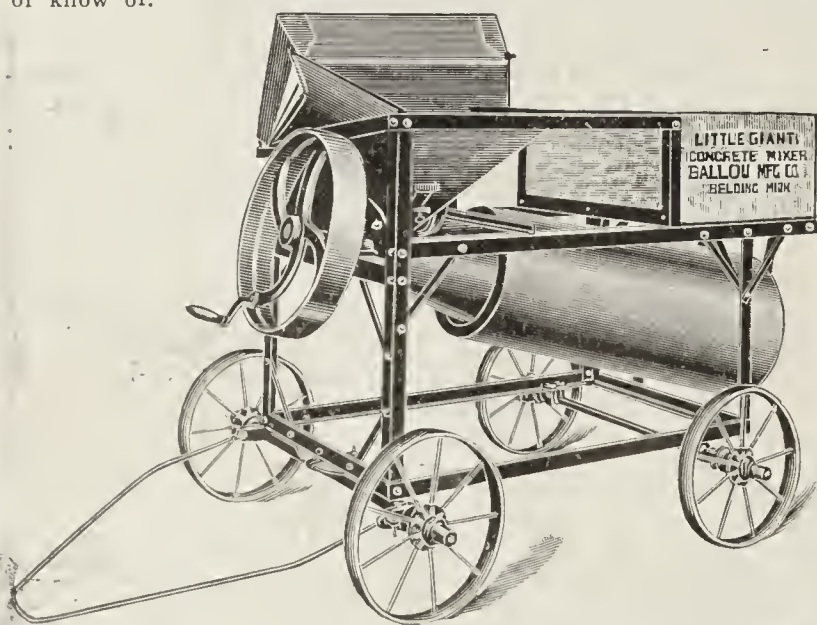
"I have used the Little Giant Hand Power Mixer for two seasons," writes I. J. H. Fender, Coral, Mich. "I have been well satisfied with the ease of operation and the quality and product of the concrete produced."

"With this mixer I put in 260 yards of concrete in two and one-half days on a road bridge in Howard City, Mich."

"I have been using the Little Giant Mixer continuously for all classes of foundation work, and in my block factory for making blocks, bricks and vaults."

"Previous to buying this Little Giant Mixer I bought a batch mixer but discarded it in a short time as it was too slow and practically worthless as a money maker."

"This Little Giant Mixer is a marvel in simplicity, for quality of concrete produced, and the smallness of expense for upkeep, and I would not change it for any other mixer that I have seen or know of."



BALLOU MFG. CO., 99 High Street, BELDING, Mich.

Compactness and Sturdiness Mean Greater Efficiency



The "Excelsior"

was designed and built to set a fast pace for the higher priced mixers and contractors say it does.

Equipped with low hopper; friction clutch; dust proof bearings; 3 H. P. engine. Can be equipped with hoist at small additional cost. Capacity $4\frac{1}{2}$ feet mixed material per batch; easily 65 cu. yds. per day.

Write for illustrated catalog and judge for yourself the extra value of the EXCELSIOR.

Good territory open for agents

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The Commonwealth Power Co. tunnel under Grand Ave., Milwaukee, Wis., recently successfully waterproofed with

"Hydrite"

COLORLESS WATERPROOFING

Hourly Leakage 5200 Gallons STOPPED! 700 ft. Concrete Tunnel 55 feet below datum was made watertight.

The success of our method eliminated the necessity of pumps and SAVED \$80.00 to \$100.00 PER MONTH.

In addition to the possibility of damage to the cables, etc., from the seepage. This tunnel, 10 years old, has been free from leakage for nine months, or since work was completed. We guarantee it to stay so.

HAVE YOU A WATERPROOFING PROBLEM?

Difficult waterproofing problems in NEW or OLD work can be economically and successfully solved. The experience of a successful organization is at your service and satisfactory results are guaranteed.

Our method of applying grout, internally or externally, under heavy pressure through pipes, or upon the surface, as the conditions require, is applicable to tunnels, reservoirs, foundations, basements, etc., of masonry or concrete construction. Leaks are not only stopped but the structures are strengthened.

Let us help you with your waterproofing problem. Write us concerning our product and methods. Ask for descriptive booklet.

WATERPROOFING COMPANY OF AMERICA
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The contractor who bids on sidewalks, curbs, curb and gutters with the idea of using wooden forms is generally bidding under a definite handicap and will always do the work with less profit than he could with steel forms.

HELTZEL steel forms are the oldest on the market. They are built by the largest builders of concrete forms in the world. Spread over the work of a season or two they mean a lower form cost per running foot of sidewalk than the use of wood forms. They are easily assembled. Work is fine, accurate and even. Write today for Free Catalog.

Heltzel Steel Form & Iron Works
Niles Road, Warren, Ohio

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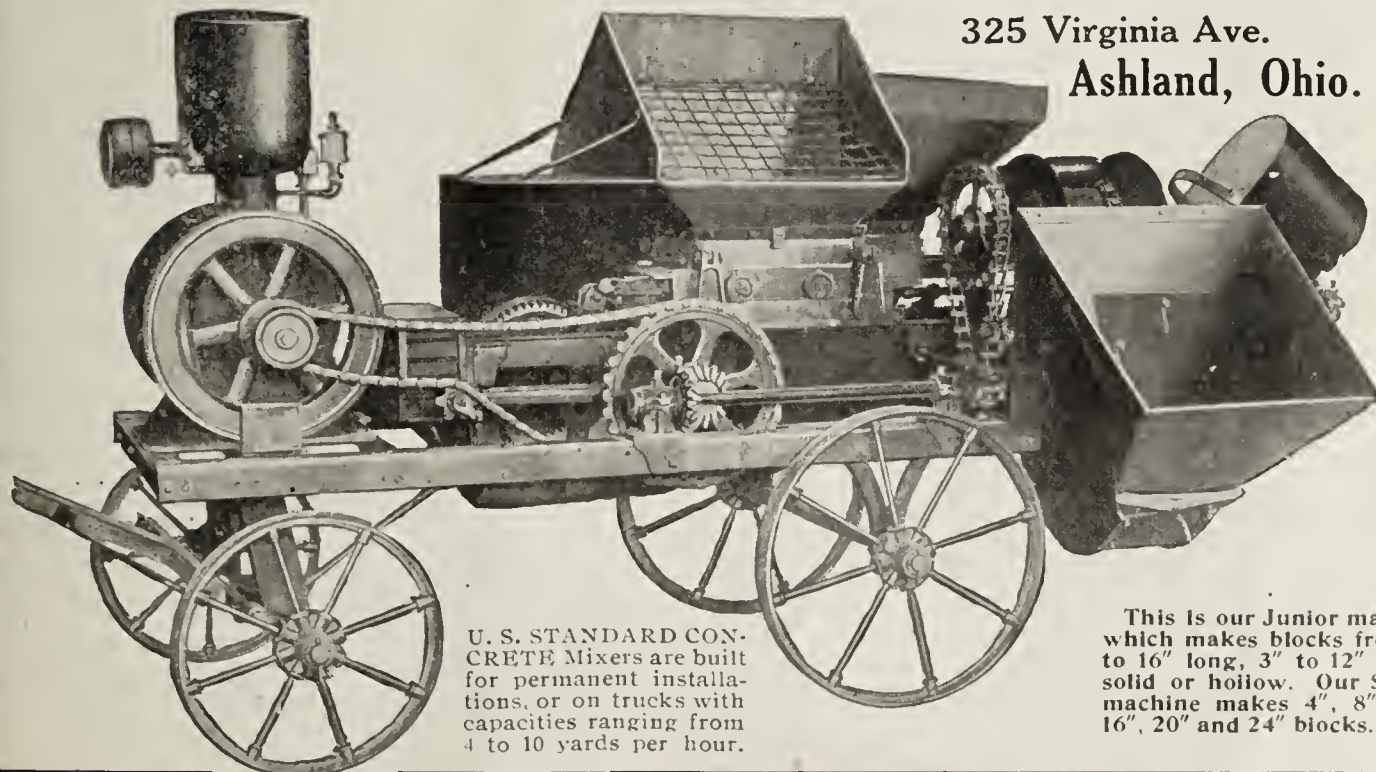
It Is Your Privilege to Test the U. S. STANDARD CONCRETE MIXER Before You Buy

The U. S. STANDARD CONCRETE MIXER is a continuous mixer with a positive measuring, proportioning and feeding device which makes it more accurate than any batch mixer ever made, because it does not depend upon the brain of the operator. It will stand the hardest tests put to it. There are no weak parts in it to cause break-downs, or defective operating parts to cause delay. All parts are interchangeable; workmanship the best. Warranted to embody the most practical and up-to-date working principles. Simple operations change the adjustments to suit any worker. Is giving excellent satisfaction to users. All we ask is a chance to have you try our mixer. We will operate the mixer to your satisfaction on the job, or no sale.

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U.S. STANDARD MANUFACTURING CO.

325 Virginia Ave.
Ashland, Ohio.



U. S. STANDARD CON-
CRETE Mixers are built
for permanent installa-
tions, or on trucks with
capacities ranging from
4 to 10 yards per hour.

We also manufacture the famous U. S. STANDARD Block Machine. Turns out solid or veneer blocks, as well as hollow blocks with oval air spaces. It is built in two sizes, and is so designed that it handles wet mixture perfectly, resulting in a block of unusual density and strength. For speed they cannot be surpassed.



This is our Junior machine
which makes blocks from 4"
to 16" long, 3" to 12" thick,
solid or hollow. Our Senior
machine makes 4", 8", 12"
16", 20" and 24" blocks.

Results Secured in the Use of Hydrated Lime in All Kinds of Concrete Construction

By Robert S. Edwards, C. E., Portland, Oregon

In a great many parts of the United States at the present time, hydrated lime has become very favorably recognized and in considerable demand as a suitable product for mixing with concrete to make it dense, and thereby rendering concrete more water-proof. The addition of small percentages of hydrated lime, when making concrete mixtures, is immediately effective in promoting plasticity throughout the mass, thereby rendering the concrete more homogeneous and keeping it so during transit, before placing. After placing concrete which contains hydrated lime, its subsequent spading in the forms is greatly facilitated, and the thorough covering of all steel reinforcing rods is more perfectly accomplished. In fact, concrete mixed with a small percentage of hydrated lime seems to almost automatically fall into place.

The proportion of plasticity and homogeneity which small percentages of hydrated lime give to concrete cannot be secured in any other way at so little added expense for the material used. On many large reinforced concrete buildings which are being constructed in the United States today, the concrete is mixed at one or two central mixing plants, which are generally located on the ground or in the basement of the building. After mixing, it is dumped into carriages and elevated, then distributed through galvanized iron pipes or chutes to the various parts of the building. It is a well known fact that Portland cement, when mixed with water, is not very plastic, some brands of cement being extremely non-plastic, and while the mixture for reinforced building construction is a rich one (generally 1-2-4), yet even so, it is sometimes very difficult to secure sufficient plasticity in the concrete to insure its being elevated, poured and distributed without considerable sticking and clogging of the pipes, attended with more or less separation of the aggregate. An extremely interesting example of the effectiveness of hydrated lime in correcting the last named condition is well worth mentioning.

Hydrated Lime Used in Concrete Work of Two Large Dams

During the fall of 1912 and the winter of 1913 The Stone & Webster Engineering Corporation constructed a large concrete dam located on the White Salmon River, about seventy miles from Portland, Oregon. Our concern (Edwards & Lazell, Engineers, Portland, Oregon) was retained by Stone & Webster and the Northwestern Electric Company, for whom the dam was built, to inspect the material used in the concrete work. A thorough investigation was made to determine the advisability of manufacturing the sand which was to be used in this work, and it was finally decided to erect a large crushing and sand manufacturing plant and secure both fine and coarse aggregate for the concrete in this manner. The sand was made by crushing a basaltic rock secured from the crusher located on the bank of the stream at an elevation of 600 feet above the river bed. The fine crushed rock was screened through a 1-4 inch mesh, and the fine and coarse crushed rock was stored in bins just above the mixing plant, from which point 80 per cent of the concrete was poured down a spout or chute 400 feet in length to the dam site below. From numerous test results it was decided to use 10 per cent of hydrated lime throughout the concrete, the

mixture being 1-3-6. It is more difficult to secure easy working concrete when using crushed rock as the coarse aggregate than when using gravel, this being due to the angularity of the crushed rock. In this case we not only had to contend with the crushed coarse aggregate, but sand sized material was also angular; in fact, to such an extent that the concrete mixture would not flow down the steel lined chutes without mechanical aid. By the addition of 10 per cent of hydrated lime, or approximately 40 pounds of hydrated lime per yard of 1-3-6 concrete, we literally transformed the physical appearance of the concrete as seen in the chutes. The concrete would leave the mixers, pass into the chutes and then onward without the slightest separation of the aggregate and would finally arrive at the dam in a perfectly homogeneous mass, where it would flatten out to a level with but little shoveling and spading in the form. The hydrated lime, together with proper mixing, had given the concrete sufficient plasticity to destroy the excess friction caused by the angular condition of the fine and coarse aggregate, and formed a smooth flowing, uninterrupted stream of concrete, to be deposited in its final resting place in the dam.

Without the use of hydrated lime in this work, it was actually demonstrated that it would have been impossible to secure satisfactory results without discarding the conveying of the concrete in chutes and instituting a far more expensive method of handling the concrete.

The writer has considerable data touching upon the use of hydrated lime in other important concrete structures, such as reinforced concrete conduits, floor slabs in building construction, concrete silos, and in lining tunnels with concrete, but it is quite satisfactory to have absolute record of its use in such important work as that noted above. Another instance where hydrated lime was used to great advantage and with considerable economy as compared to other water-proofing compounds considered for this work should be mentioned.

In 1910 the Portland Railway, Light & Power Company constructed a large, hollow reinforced dam across the Clackamas River, some thirty miles from Portland. The construction of this type of dam was a new departure on the Pacific coast and the work was undertaken with great care. The dam was 90 feet high, over 600 feet long, and hydrated lime was used in all the concrete which was to be exposed to water pressure. All of this work was of reinforced concrete, with reinforcing steel closely spaced on centers. The aggregate was carefully graded sand and gravel, concrete mixture being 1-2-4 with 7 to 10 per cent of hydrated lime added to the weight of the cement per yard of concrete. The concrete as poured was plastic and homogeneous and went into place with extreme ease, while the finished concrete was uniform and dense and absolutely impervious to the flow of water.

These specific records of the use of hydrated lime in the concrete work of two of the largest hydro-electric developments on the Pacific coast during the last four years serve as convincing engineering proof, which can be readily verified, that hydrated lime is a product of great intrinsic value and one that can be used with utmost safety in concrete work for the purposes named above.

Below are some notable concrete structures recently built in which Hydrated Lime was used in the concrete work to make the concrete dense and thereby rendering the concrete more water proof:

Full detailed information of the methods and cost of using Hydrated Lime may be secured from any of the following manufacturers of Hydrated Lime:

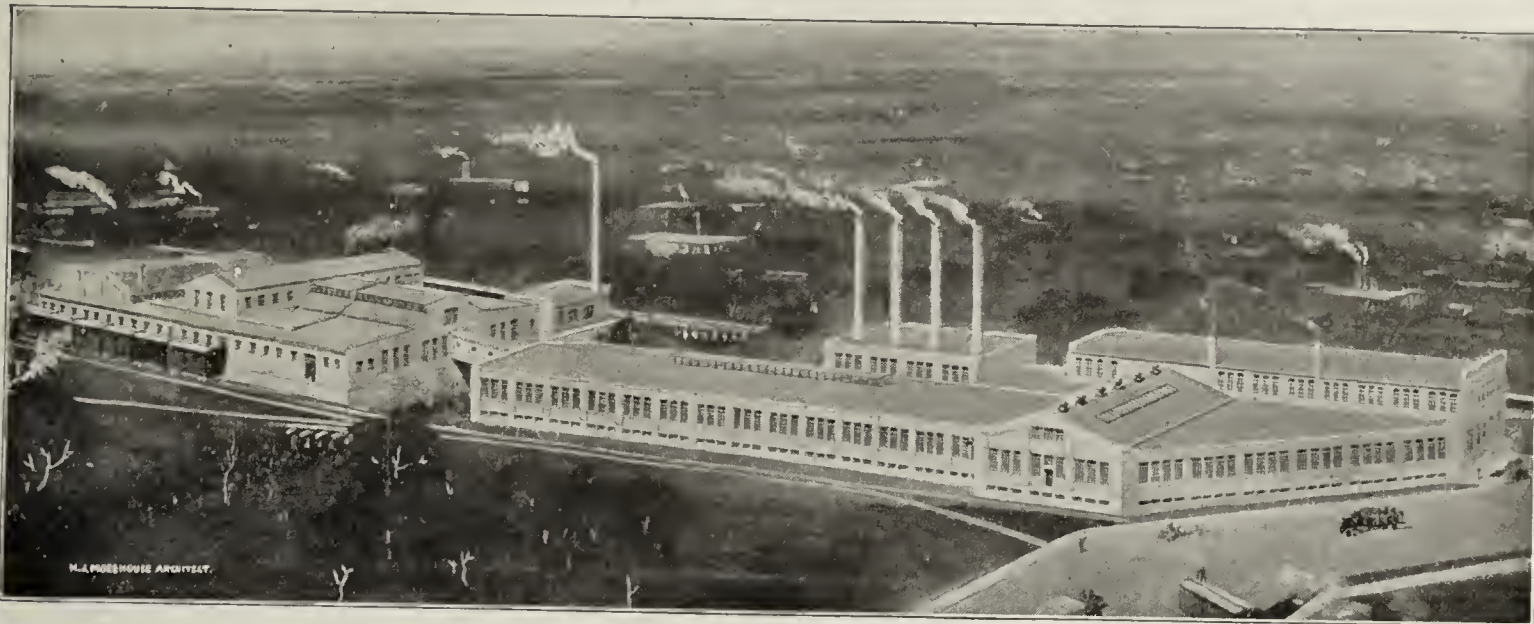
Longview Lime Works,
Birmingham, Ala.
Charles Warner Co.,
Wilmington, Del.
Marblehead Lime Co.,
Chicago, Ill.
Ohio & Western Lime Co.,
Huntington, Ind.
Security Cement & Lime Co.,
Hagerstown, Md.
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Riverton, Va.
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Standard Lime & Stone Co.,
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To protect a basement of 31,500 sq. ft. of floor space against an eight or nine foot head of water, was the problem that confronted the builders of the plant, shown above, the magnificent home of the Michigan Carton Co., Battle Creek, Mich.

The basement of this plant is 14 feet high, 75 feet wide and 420 feet long. The building stands on very low, marshy ground, on what was formerly, in fact, the bed of the Kalamazoo River. At present, however, the stream has been diverted and flows like a mill race, in times of high water, between the main buildings. At such times the water rises to a depth of 8 or 9 feet above the floor level and the rear wall of the basement must act as a retaining wall against the flood.

"Hydrated Lime" was the happy and effectual solution of this difficult problem and facts are given by Mr. M. J. Morehouse, the well-known architect of the plant, who had charge of the work.

The floors and walls are of concrete, both waterproofed, the latter up to a height of 10 feet. The mixture used was one part cement, four and one-half parts of sand and gravel, and seven to eight per cent by weight of cement of "Hydrated Lime."



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90% Portland Cement; 10% Hydrated Lime.

Hydrated Lime is simply commercial lime scientifically slaked in the process of manufacture. It is shipped to you in 40 lb. paper bags or 100 lb. cloth bags, and there is no fire risk connected with its storage.

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Locomotive Crane
No. 7½ Gyratory Crusher
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as Chief Chemist or Asst. Supt. by graduate chemical engineer; have worked six years in all departments of cement mill,—with present employers 3 years as Chief Chemist. Address H. F., care Cement & Eng. News, 1117 Schiller Bldg., Chicago, Ill.

WANTED.

Wanted to hear from owner of good cement plant. Send cash price and particulars. D. F. Bush, Minneapolis, Minn.

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NEW BOOKS

Rock Drilling. By R. T. Dana and W. L. Saunders. Pp. 319; ill., index. For sale by the Cement & Engineering News, 1117 Schiller Bldg., Chicago. Price \$4.

Following a general introductory statement covering blasting and explosives, this volume treats in detail the methods and costs of open-cut excavation and submarine rock-drilling. It is based principally on material collected and compiled by engineers of the Construction Service Co., and includes accurate records of cost and drill duty in many kinds of work. Diagrams and tables are freely used in such shape as to make more than a mere record of cost. Accurate comparisons and analyses become easy. The book is well written and well illustrated and is sure to prove of large value to consulting and constructing engineers.

Reinforced Concrete Construction is the title of a 300-page publication by H. Adams and E. R. Matthews just received from the press. The book contains enough, and fortunately not too much, mathematics to make it interesting and valuable to the reader and treats in an exhaustive and practical manner all branches of reinforced concrete construction. More than 300 cuts illustrating modern work done in concrete add life and charm to the ambitious compilation. No contractor or practical superintendent striving for mastery in this art should be without it. Price, \$3.00; forwarded postpaid by Cement and Engineering News upon receipt of price.



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Send us fifty cents and we will send, freight prepaid, to any point in the United States, east of the Mississippi and north of the Ohio Rivers, a granite-faced block, one-half rock-faced and one-half plain-faced. **YOU WILL SAY WHEN YOU GET IT THAT YOU NEVER SAW A CEMENT BLOCK BEFORE.**

They are positively cheaper to make than the ordinary dry-tamp, sand faced block.

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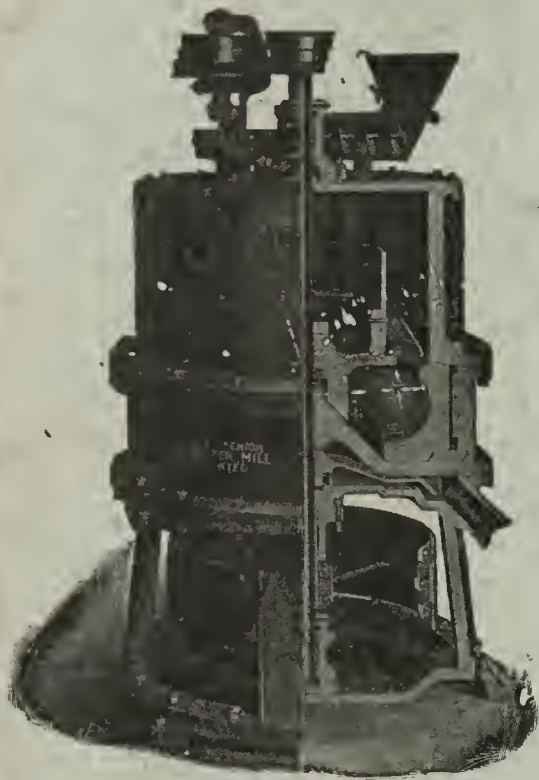
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CEMENT AND ENGINEERING NEWS

Vol. 27

SCHILLER BUILDING, CHICAGO, APRIL, 1915

No. 4

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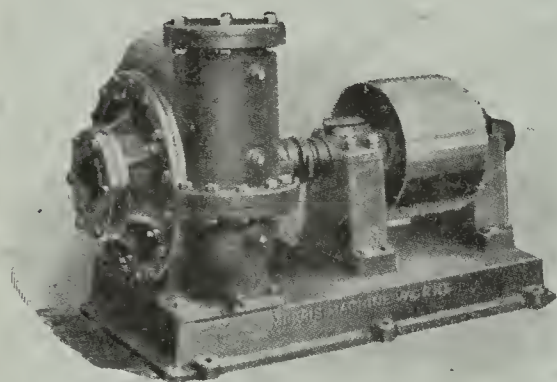
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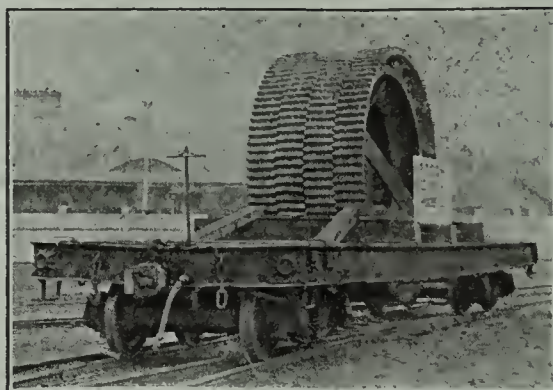
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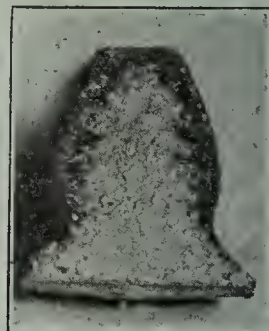
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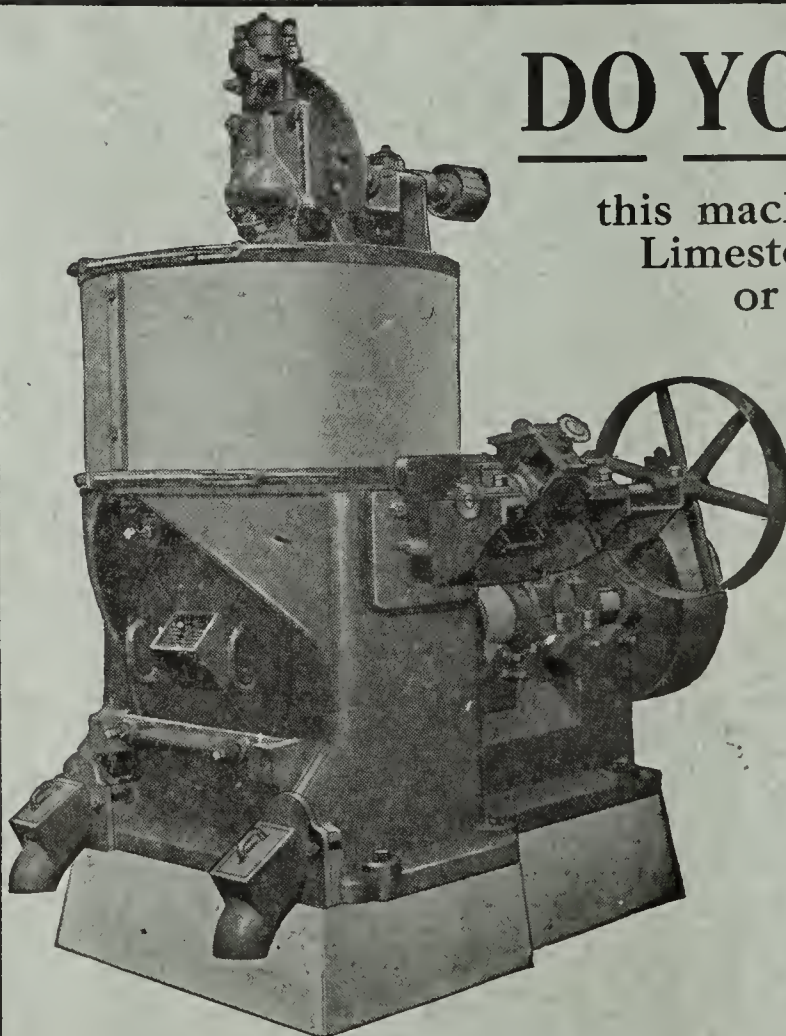
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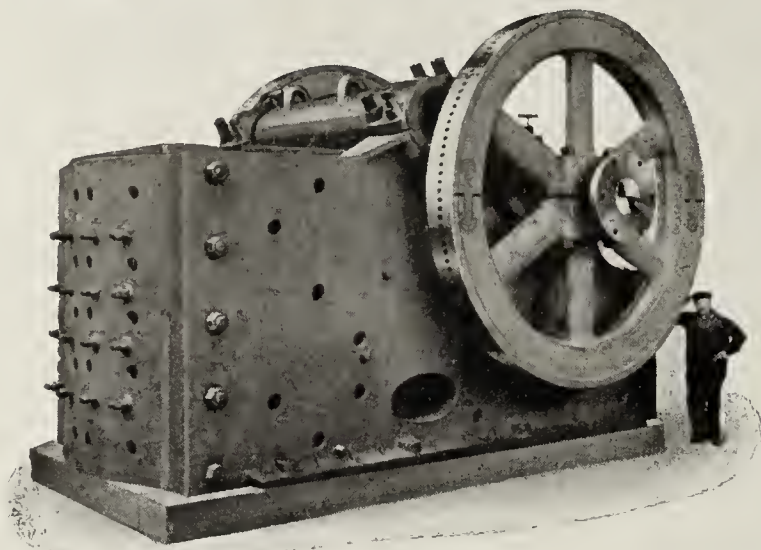
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Particularly adapted for Cement Plants: For use in connection with Steam Shovels of largest size. Size of Feed Openings: 36" x 24", 42" x 40", 60" x 48", 84" x 60". The advantages are: Large Feed Openings, Low Initial Cost, Low Cost of Maintenance, Low Power Consumption, Saving in Dynamite, Saving in Labor, over hand loading, and above all **absolutely reliable**. One of our 84" x 60" Superior Jaw Crushers crushing hard trap rock has been in operation for nearly five years without the replacement of a **single part**. Described in our Bulletin No. 44-108.

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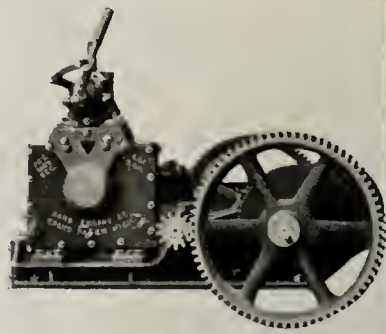
Dake Engine Co.

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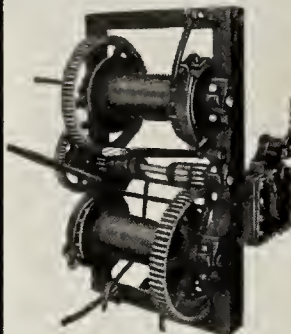
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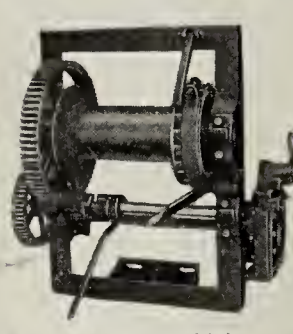
Reversing Steam or
Air Motor



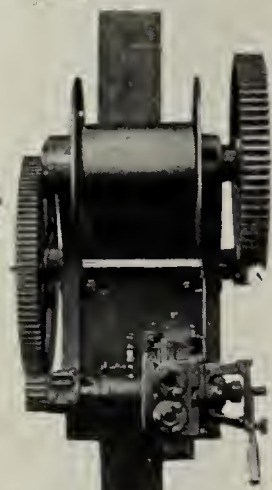
Swinging Engine



Double Drum Motor
Crab



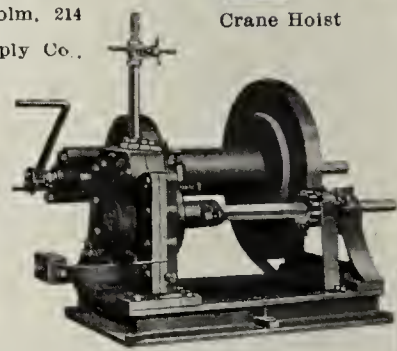
Single Drum Motor
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Crane Hoist



Direct-Connected Centrifugal Pump



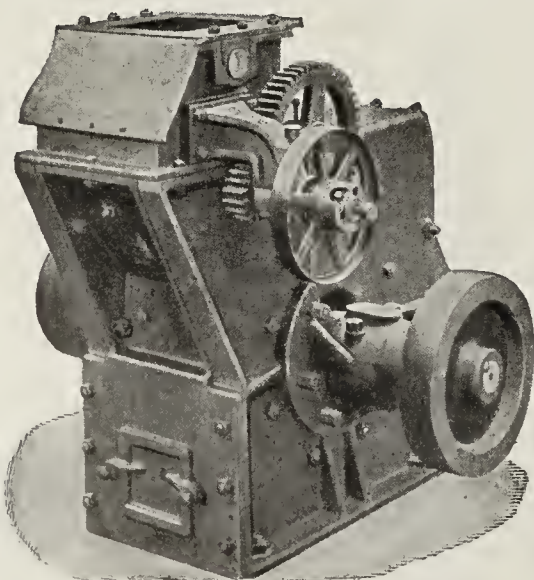
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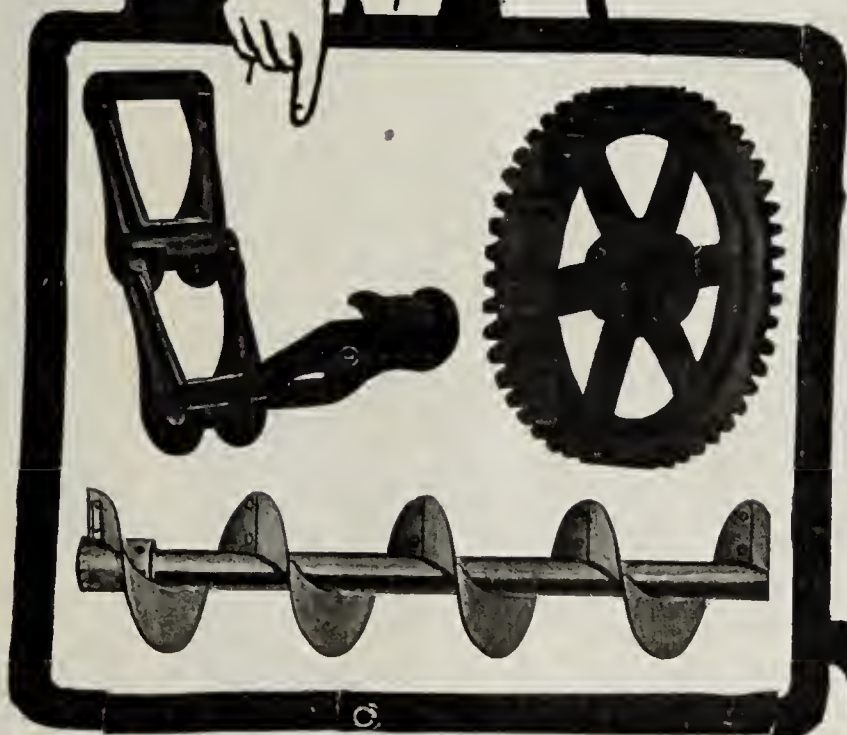


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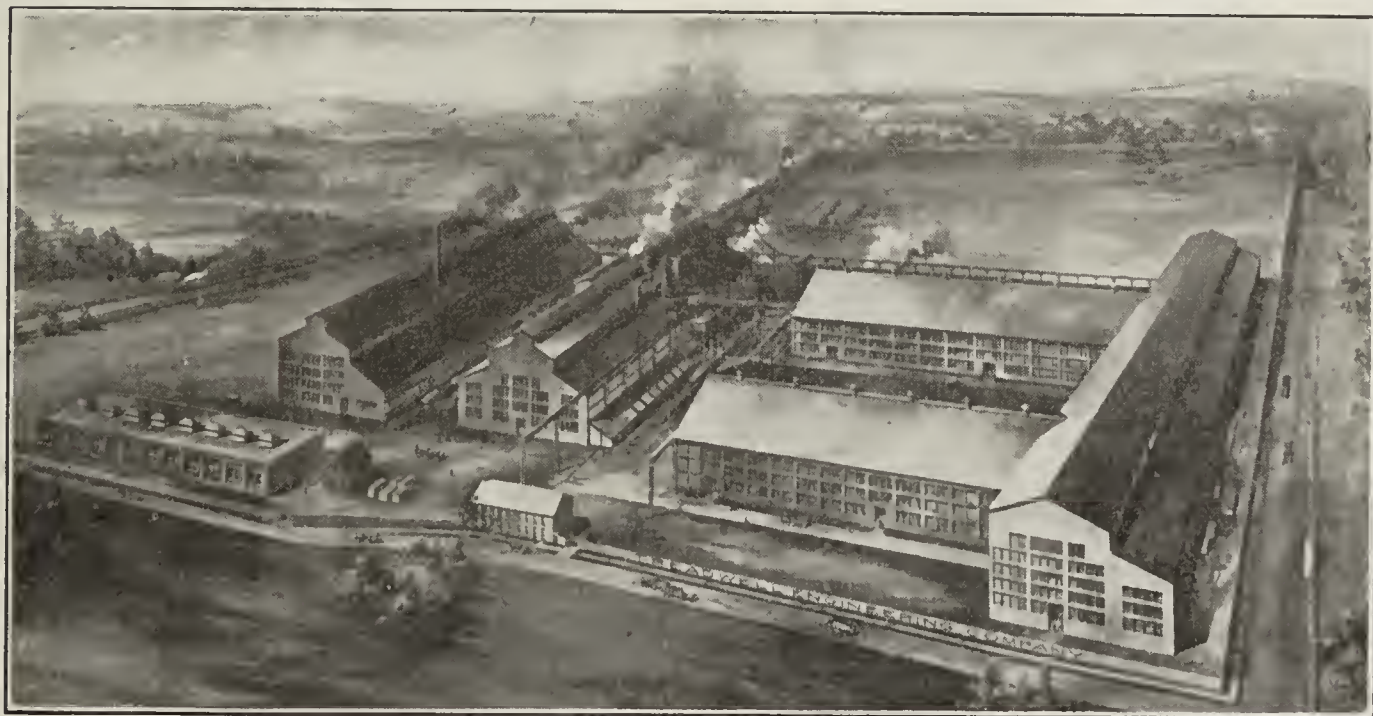
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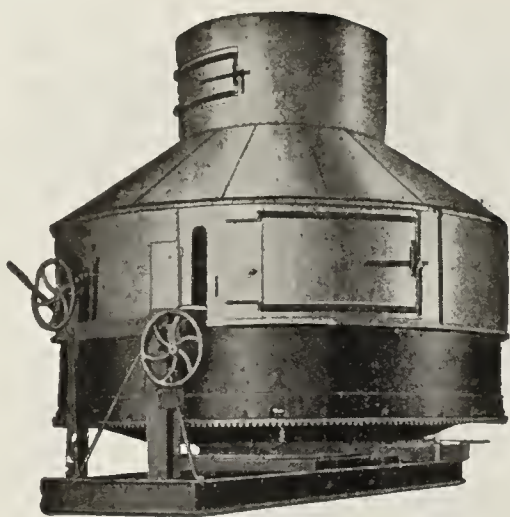
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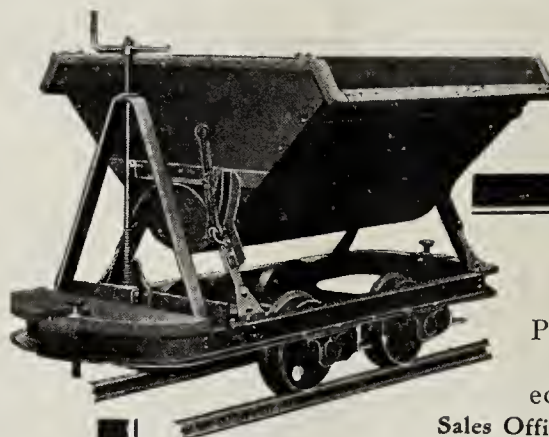
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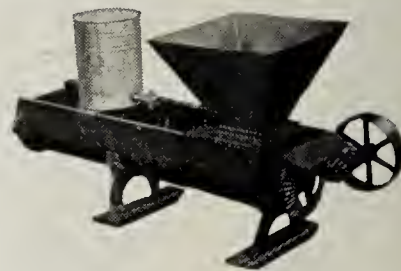
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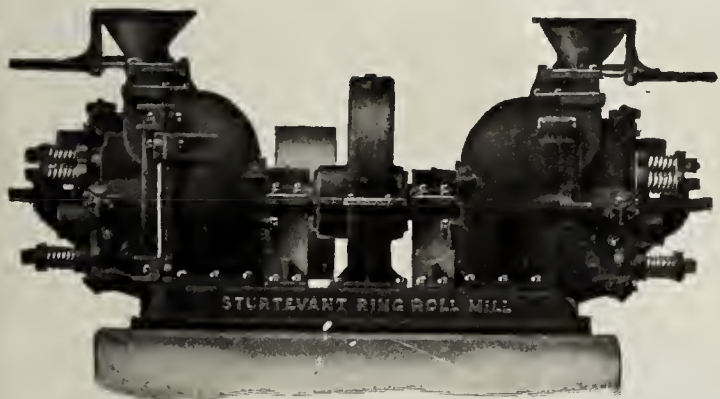
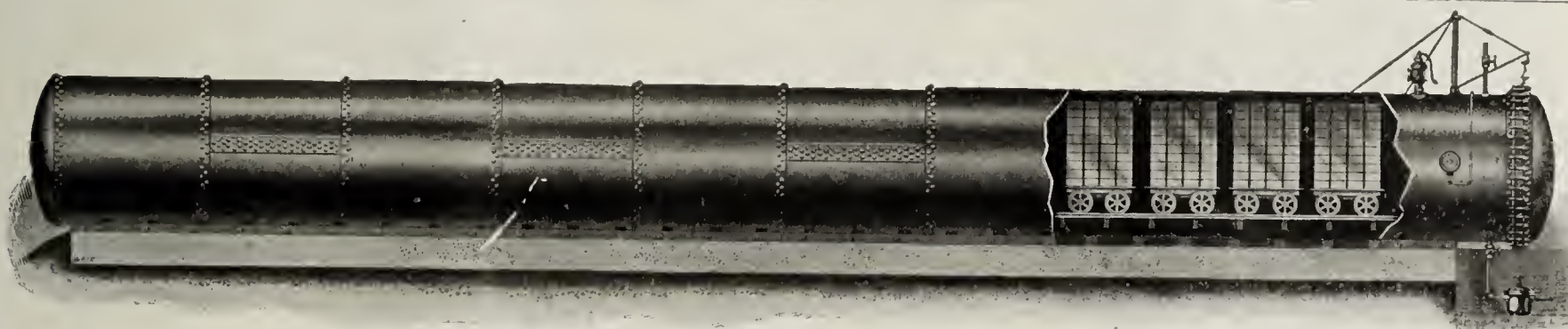
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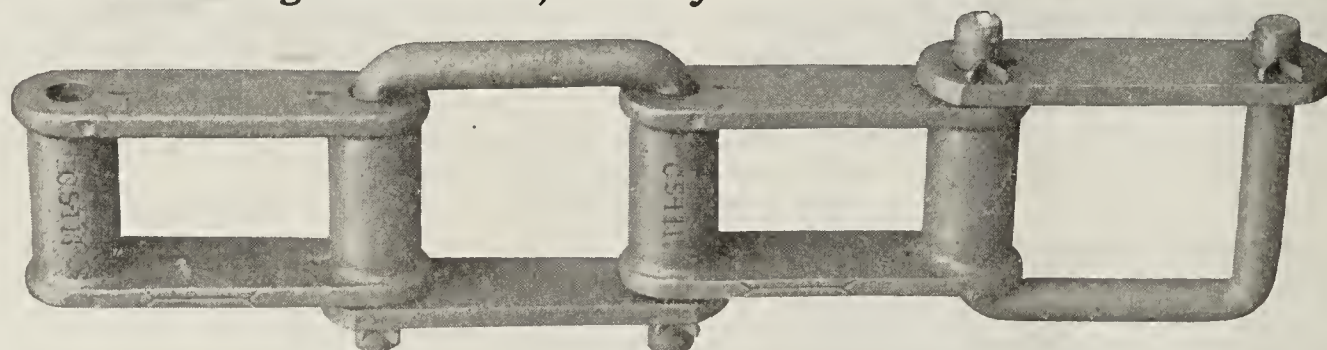
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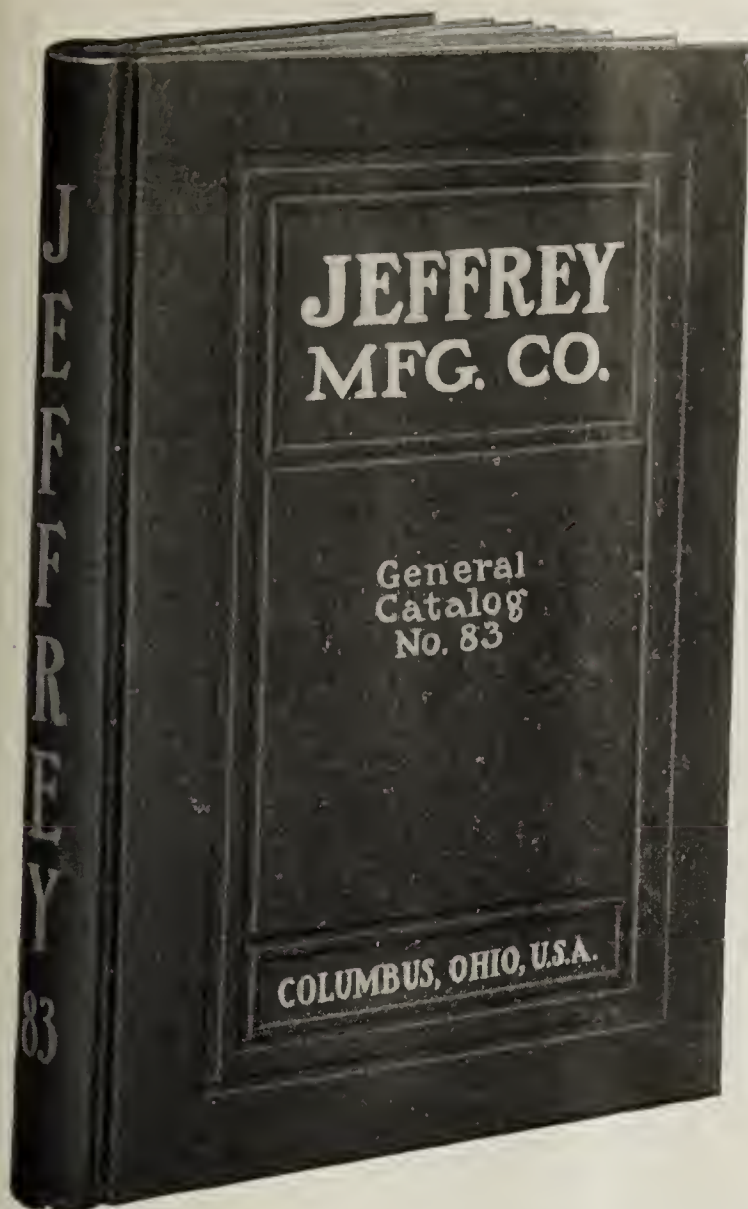
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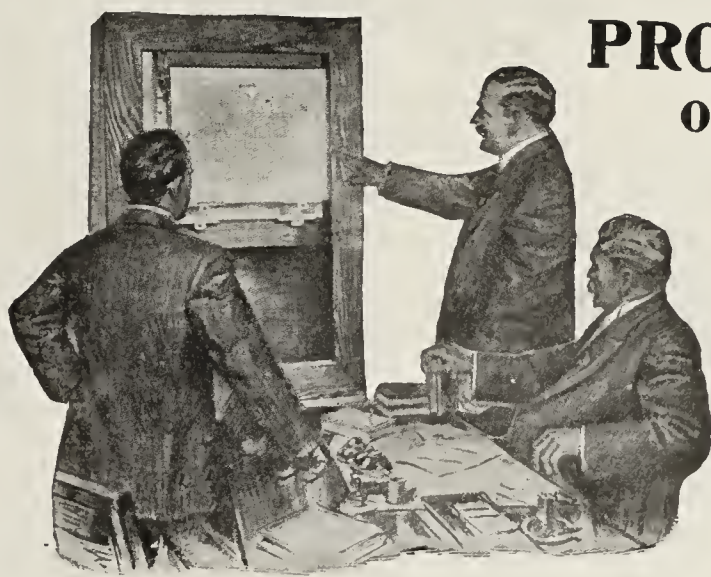
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SALE OF BANKRUPT CEMENT PLANTS

The property of the United Kansas Portland Cement Company, consisting of three large plants, one at Iola, one at Neodesha and one at Independence, Kansas, will be sold by the Trustee in Bankruptcy under order of United States Court at Iola, Kansas, at 10 o'clock on April 24th.

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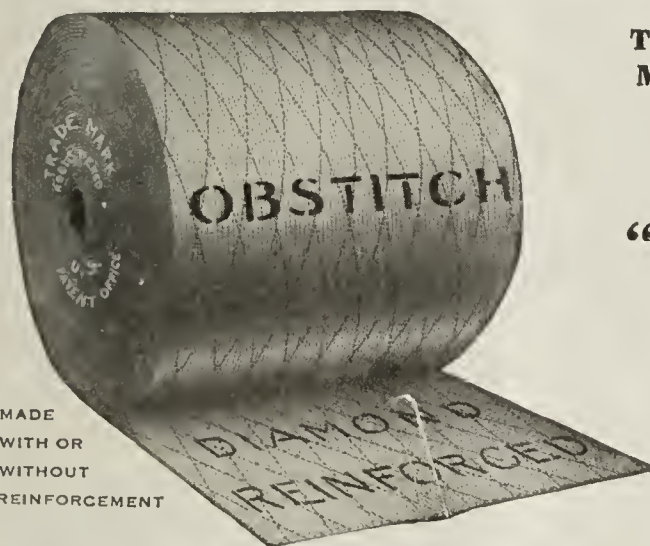


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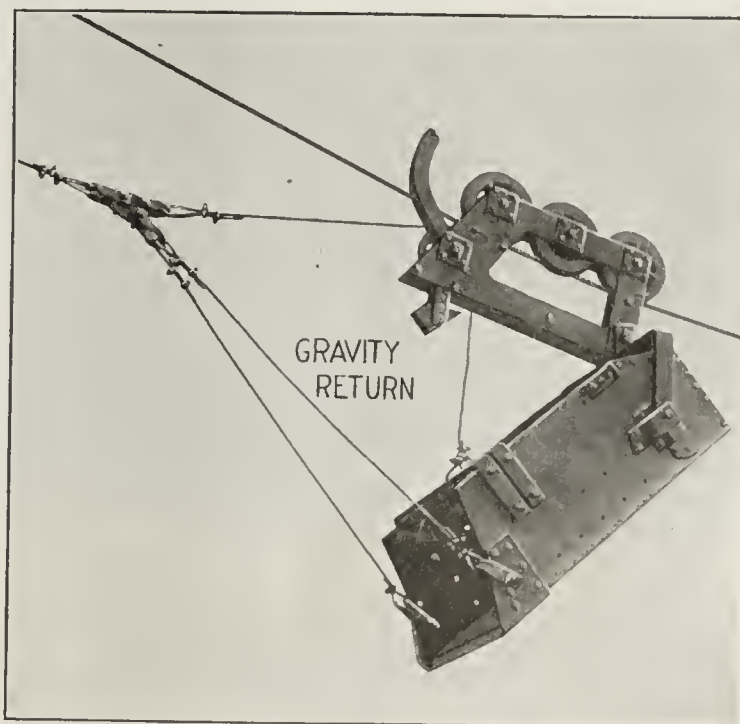
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CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

WILLIAM SEAFERT, Editor and Publisher

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JOHN F. WALDRON

Advertising Manager

CHICAGO, APRIL, 1915

SAND AND GRAVEL LAW SUITS

We learn from a number of friends, who are engaged in the sand and gravel business, that the various legal arguments that have come up in recent years in producing and marketing sand and gravel—and which we reprinted occasionally in Cement and Engineering News—have been of a great deal of help to companies involved in law suits of a similar kind.

For this reason we shall be glad to learn the details and outcome of suits now pending, with which we should like to continue to make our readers acquainted now and then.

The sand and gravel business has brought up a multitude of questions hitherto unknown to the legal fraternity. In many instances an individual or company was allowed for years to take sand and gravel out of a river undisturbed, until a competitor or the community in question discovered that the party managed to secure a little profit out of his laborious work, however, at nobody's expense. This was more than many people in the community could stand. An injunction was frequently the outcome of these complaints and the indefinite suspension of a slowly developing business into which a courageous contractor of small means had ventured.

Another point which handicapped the sand and gravel producer's business were the arbitrary and exorbitant freight rates often charged by the railroad companies, which made the business, in many instances, unprofitable. The condition of the freight cars and the time of delivery on the part of the railroad companies furnished, of course, additional subjects for debate.

In settling these questions complete chaos reigned for many years in the law courts. Similar cases were frequently decided in diametrically the opposite way. By this time, however, the history of this pandemonium has crystallized to something more or less definite, namely, a few typical cases which received special attention in technical magazines. The defendant, therefore, presented the literature on the subject to the law court as his only means of protection, and

judges did not fail to make ample use of the arguments and decision as the only guide in this matter.

This explains why a number of contractors engaged in the sand and gravel business called our attention to the fact that the articles published by Cement and Engineering News have been of the greatest help to them and asked us to continue the publication of similar disputes, though they may appear to be uninteresting reading to many of our subscribers.

AMERICAN CONCRETE INSTITUTE

The sessions of the American Concrete Institute recently held in Chicago prove that the organization has become the most important technical and practical society for the promotion of better methods of construction that has ever been devised. Its importance reaches every home-builder, as well as the designers and constructors of the important commercial and public structures. In all the range of buildings the first and by far the most important must always be the problem of the home-builder. In all time past we have built in the most temporary and dangerous way because of the insistent presence of the original forest that made wooden buildings the practice of least resistance. This has however changed, and through the work of the institute more than any other influence several plans and systems of construction have been developed by which even the home builders can enjoy the privileges and benefits of fireproof concrete construction, without spending any more money even in the first cost than it now takes to build a wooden structure. This applies to the country residence or the city mansion, and includes the barn, the silo and all the other necessities and conveniences required for the housing of human beings, their domestic animals, and the indispensable food crops. So the concrete institute has worked out better than any other organization the greatest benefit to the human family in the ever present problem of building best and safest, and are giving mankind the broadest blessing since the Phoenicians handed down the alphabet. A great deal of knowledge existed in scraps here and there before the work of the institute began, and the first work was to concentrate and organize all of this information and then reach further on into the subject. Now, the American Concrete Institute has an answer for practically every question and every problem that the builder of any conceivable kind of structure can call for. Along with, and keeping pace beside the essential structural study has always been kept the artistic or decorative features, so that safe, sanitary and permanent concrete structures are at the same time designed for beauty and elegance and by the originality of the conception and the hitherto unknown flexibility of the material, originality is being achieved in a dozen different ways, both in the lines of design, the shadow values and the coloring of the surfaces. Original orders of architecture and new ideals of decoration seem clearly to indicate that a new school of basic design will be developed in this twentieth century by the very men who are foremost in the work of the institute. In fact many of them are doing new things and working upon original ideas that show the red blood of progress for the use of future builders that come after us.

ANNOUNCEMENT

The Cement and Engineering News will move its offices about April 25th to 672-673 Transportation Bldg., Chicago, Ill.

Sand-Lime Brick in Canada

By H. W. Terry.*

Feeling that the subject was worthy of some effort and realizing that my knowledge of it would have to be supplemented with recent facts and figures from those in the business, I have communicated with every company I knew of operating in the Dominion and have thereby seen at closer range the creditable size and growth to which the industry has attained.

The introduction of the sand-lime brick industry into Canada took place under what might well be termed favorable circumstances.

From the information at hand we understood that it was firmly established in Germany and other parts of Europe, and we knew that several plants were in successful operation on the United States side of the imaginary line.

This would almost warrant the belief that the experimental stage was passed and that the product would meet with a fairly good reception by those connected with the building trade.

Its history, however, shows that in many localities it was met with strong prejudice and a stiff opposition.

In 1901 a plant was installed at Brandon, Manitoba. It was equipped with Boyd machines and the so-called Hunnekes system. About the same time two other plants were also erected at Montreal, Quebec. One was known as the Decature plant and equipped similar to the one at Brandon. The other was called the Sheppard plant.

These three appear to have been the first attempts at sand-lime brick-making in Canada.

Not much headway was made by any of them, in fact, the two at Montreal were failures. The Decature plant had a hardening cylinder blown up and it was never operated afterwards, being boarded up when visited some five years ago.

The Brandon plant continued as an inner and outer until it was remodeled four years ago. Since then it has made good progress and is fast re-establishing itself in the opinion of the trade.

In 1903 a plant was started at Ottawa, Ontario, and while not much of its early history was obtainable, it has evidently met with a fair measure of success.

In 1904 a plant was installed at Beausejour, Manitoba, and with Winnipeg for a market, a ready sale was found for its product. Judging from the present appearance of some of the buildings constructed with the brick made there, they succeeded in turning out a good article.

In the following year two plants were installed in Toronto, and on account of it being an old established clay center, sand-lime brick met with about the keenest opposition in its career. The prejudice was due to the color and the lack of knowledge regarding its lasting qualities, especially under Canada's climatic changes.

This condition of affairs was considerably augmented by the attitude displayed toward each other by the promoters and advocates of the rival systems of manufacturing, which were trying to establish themselves in the country, statements being spread broadcast to the effect that a satisfactory brick could not be made by this method or that, as the case might be.

With these factions divided against themselves it is of little wonder that the clay industry, with its ancient record, was able to put up a stiff and effective opposition.

Architects refused to use them and although some builders were willing to give them a trial, the difficulty in getting them accepted by the city officials was the cause of considerable trouble, consequently many hesitated in buying.

Even under these difficulties sand-lime brick began to find a market—first for backing up in the smaller buildings, then in larger, and finally as they became better known, they were used throughout in several fair sized structures. In some of the latter cases the sale was accompanied by a bond for their good behavior.

About this time the industry began to take on a permanent look, and in 1906 plants were installed at Port Arthur and Petersborough. The latter, however, never was a factor in the business, and after being idle for a time the equipment was transferred to Prince Albert.

In 1907 two plants were erected at Brantford, Ontario, followed in 1908 by others at Victoria, British Columbia, Edmonton, Alberta and Regina, Saskatchewan.

This shows about ten plants in active operation up to this time, and as the industry became better known the subsequent increase was quite rapid.

In 1910 one each was located at Winnipeg, Saskatoon, Calgary and Sydney, Nova Scotia. The latter was for the manufacture of slag brick.

During the year 1911 five plants were added to the list with Winnipeg, Toronto, Vancouver, Prince Albert and Moosejaw as their location, while the year 1912 tops the list with six more, two being located at Edmonton, two at Toronto and one each at Montreal and Calgary.

Including the one installed in Toronto this year this makes about twenty-seven plants in successful operation at the present time with a combined daily capacity of approximately eight hundred thousand.

While these figures are taken from the rated daily capacity of the plants the actual yearly output will fall considerably below this estimate, as in some sections plants do not operate during the winter season.

As a producer and consumer of sand-lime brick the Province of Ontario leads with a daily rating of three hundred thousand, Toronto alone accounting for upwards of two hundred thousand. Alberta and Manitoba follow with about one hundred and fifty thousand each, Winnipeg being the center of consumption in the latter province.

Saskatchewan ranks next with about one hundred and twenty-five thousand, followed by British Columbia, Quebec and Nova Scotia in the order named.

The provinces of New Brunswick and Prince Albert have not yet been invaded by the industry.

With the exception of the Toronto district, which produces the natural colored brick only, a striking feature of the industry in Canada is the number of firms, especially in the West, which devote considerable of their time to the manufacture of colored and face brick.

While this is due largely to the fact that in many of those localities the clay brick are of rather poor quality, it denotes the firm basis on which the new business is being established, and the thoroughness in which the wants of the building trades are being catered to.

To show that the stamp of approval has been placed on sand-lime brick it is only necessary to mention a few prominent buildings constructed with them in

*Secretary Harbour Brick Co., Toronto, Ont. Paper read at annual meeting Sand-Lime Brick Association.

some of the cities of the Dominion, and even then one need refer only to the newer centers of activity.

In Winnipeg the Stanley Mineral Brewery Company's plant in which 1,200,000 were used. The Fort Garry Hotel and Union Station costing approximately \$4,500,000.

At Brandon we have the Brandon asylum at a cost of nearly a million dollars, and the Empire Hotel, which is a five-stock block.

Among those to be mentioned in Saskatoon is the Standard Trust building and the Drinkle buildings.

Calgary has the Moxam apartments, the Calgary Furniture building, and several others to its credit.

Many more could be included in this list, but these will prove that there have been and are being erected throughout the Dominion from coast to coast, standing monuments which are a credit to the industry in which we are all interested.

From a recent issue of the Brick and Clay Record, which gives figures showing the number of sand-lime brick plants in operation in the United States as seventy-one, and giving their combined yearly output as 174,000,000 or an average of 2,500,000 per plant, by comparison we view with considerable satisfaction the expansion of the industry in Canada.

Starting several years after the advent of the business into the United States, and in a country with approximately one-tenth the population, we have already equalled in production and consumption the figures quoted for the United States by the above journal.

Four reasons have contributed largely to the success of sand-lime brick in Canada:

1st. The gradual depletion of our timber reserves through exportation, and the consequent sharp advance in lumber prices to almost prohibitive levels.

2nd. The passing by all cities and larger towns of stringent building by-laws, prohibiting frame structures.

3rd. The great national development taking place in Canada, supplemented by heavy immigration, resulting in an enormous and ever-increasing demand for construction material of all kinds and especially for building brick.

4th. The limited supply of clays and shales in some districts suitable for the manufacture of brick, and in others the fact that almost every source of supply in the immediate vicinity was already being drawn upon.

Three other reasons are necessary for the complete establishment of the industry:

1st. The unremitting effort of the manufacturers to keep the quality of their product up to the highest standard. This will eliminate one of the favored sources of criticism.

2nd. The adoption of a standard size for all the standard grades of building brick. The feature then to be aimed at by the manufacturer and sought after by the builder will be **quality**. When one takes into consideration that an important factor in the brick business is the speculative builder, who builds only to sell it can be readily understood that bulk rather than quality gets the preference.

3rd. Action on the part of this association to prevent the exploitation of the industry by promoters and others who seek to gain by the installation of a plant whether the surrounding conditions warrant the investment or not.

Today sand-lime brick is recognized as one of the standard building materials and those who have taken the opportunity of studying its merits have no hesitation in recommending it for all purposes where brick

can be used. It is rapidly gaining in favor and many who once opposed it are now boosters.

Judging from the past clean record of progress, we look into the future with an eye of confidence and a feeling of optimism which is only a reflection of the unanimous individual opinions received from different points.

In the short time at my disposal I was not able to compile a detailed list of tests made throughout the Dominion, but I have obtained from the Engineering Department of the University of Toronto, along with some from other sources, the results of a number of tests made on samples submitted from different points of manufacture throughout the country.

I will only take up your time in reading the detail figures of a few, as follows:

Faculty of Applied Science, University of Toronto.

Crushing Test.

December 21, 1911.

Bricks were taken as found, without any preliminary drying or wetting, and tested half brick between blotting paper cushions in a Reihle testing machine. Brick were crushed on their flat faces.

	Result of Crushing. Test, Area Sq. Inches.	Total Load Pounds.	Ultimate Crushing Strength, Lbs. Per Sq. Inch.
Half Brick, No. 1.....	16"	66,880	4,180
Half Brick, No. 2.....	16"	64,330	4,020

May 23, 1912.

	Result of Crushing. Test, Area Sq. Inches.	Total Load Pounds.	Ultimate Crushing Strength, Lbs. Per Sq. Inch.
Brick, No. 1.....	36.3"	147,100	4,050
Brick, No. 2.....	36.3"	150,150	4,140
No. 1 Brick: First crack occurred at 128,000 pounds; failed in upper and lower wedge.			
No. 2 Brick: First crack occurred at 124,000 pounds; failed similar to No. 1.			

While these tests go a long way in creating confidence in the brick, they are overshadowed by the actual results obtained.

When one takes into consideration that the round of seasons in Canada bring with them a variation of from, say, 90 degrees above to 20 degrees below zero, the force of the statement will be appreciated when we can say, without fear of contradiction, that no evidence of failure is on record which reflects on sand-lime brick.

STATEMENT OF OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF AUGUST 24, 1912.

Statement of the ownership, management, circulation, etc., required by the act of August 24, 1912, of Cement & Engineering News, published monthly at Chicago, for April, 1915.

Editor, William Seafert, 64 W. Randolph St., Chicago.

Business Manager, John F. Waldron, 64 W. Randolph St., Chicago.

Publisher, William Seafert, 64 W. Randolph St., Chicago.

Owners: (If a corporation, give its name and the names and addresses of stockholders holding 1 per cent or more of total amount of stock. If not a corporation, give names and addresses of individual owners.) William Seafert is sole owner.

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WILLIAM SEAFERT.

Sworn to and subscribed before me this 16th day of March, 1915.

(Seal)

GORDON BERG, Notary Public.

(My commission expires Aug. 16, 1916.)

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Why Indiana Leads the World in Concrete Bridges

By Daniel B. Luten, Mem. Ind. Eng. Soc.

It has been very generally recognized as a principle of engineering construction that in the building of a bridge or other structure the engineer should endeavor to define and specify the results to be obtained, leaving to the contractor his choice of methods. This same principle may be broadened and extended with advantage to the entire process of letting concrete bridges.

Steel bridges have usually been let on plans showing in a more or less general way the sizes of members and their arrangement, but leaving to the bidder the details of rivets and connections, in order that these details may be adapted to each particular shop and equipment. This is because a steel bridge plant requires large investment of capital and a serious hardship might be worked on one bidder by requiring him to conform to a detail that might be more acceptable to one of the other bidders.

In designing concrete bridges, however, the average county engineer has perhaps lost sight of the fact that he was employed as a consulting engineer to advise his board of commissioners how to secure the best bridge for the least money, and has instead acted as designing engineer to supply the complete detailed plans and specifications. In concrete bridge construction almost any one can qualify as a bidder, regardless of training. Railroads and private corporations limit their bidders to firms of known experience, but the public official is bound, if not legally, then at least by the force of public opinion, to award the contract to the lowest bidder, regardless of experience. Under such conditions there are many who aspire to become wealthy and achieve fame as bridge contractors, inspired thereto by stories of excessive profit made by bridge builders, usually circulated by some state engineer with more aspirations for political advancement than for strict adherence to the truth. Many a sidewalk builder, farmer, teamster or petty politician has thus been inspired with the idea of erecting a beautiful bridge, as a monument to himself, and has found too late that he has built but a gravestone instead. Did you ever listen to the men who hang on the rail watching the workmen on an important piece of construction? Does not every man of them have a better method of solving the construction problem? And if a single one of them really had a better solution where would he find the time to explain it to his neighbors?

It has been said that nine-tenths of all business projects at some time in their history pass through receivership or bankruptcy. Certain it is that nine-tenths of the contractors who bid on detailed plans on file for concrete bridges do so at a loss to themselves and almost necessarily with greater loss to the community; for concrete work done without profit by the builder is rarely satisfactory to the purchaser.

The unfortunate feature is that the loss does not always make itself known to the ignorant bidder until the work has reached the critical state where most care and expense is necessary—on the finish and railing.

The concrete bridge industry is thus actually overcrowded with incompetents, who do not know how to compute the cost, but take a flyer on the engineer's estimate, which is often equally unreliable, since it is necessarily based on previous lettings.

Moreover, the most satisfactory and efficient forms of concrete bridges are patented and the patents will not expire for years to come. If plans for a particular patented bridge be placed on file alone, with a specified royalty in order that all bidders may be on an equality, the engineer is in danger of being charged with favoritism, or with lack of ability to devise a suitable design. Hence there is even more reason in concrete bridge lettings that each bidder should have an opportunity to submit his details in order to secure competition between patented features, just as in steel bridges variation is permitted in shop details.

County officials have been repeatedly betrayed into awarding contracts to incompetents because they were lowest bidders on the completely detailed plan on file. As a consequence many commissioners will go far out of their way in their efforts to avoid repeating such a mistake. And then the opposition newspaper sets up a howl of "graft," when the official is honestly endeavoring to improve the construction of the bridge by placing its erection in competent hands. We go to the watchmaker for repairs to our watches, we buy our shoes from the shoemaker, we require a trained man to run an automobile or even to drive a team, but we let our concrete bridges by public letting to any "dub" that can produce a certified check, especially honoring that one who has made the most mistakes in estimating his bid.

How can this situation be remedied? By extending the principle that results alone should be defined by the engineer; by the county engineer assuming his proper relation of consulting engineer; by a method of letting that will secure wide competition between expert builders; that will permit competition between patented devices; yet with award to the lowest bidder and with decision as to award under the absolute control of the county engineer.

Such a method is now disclosed in the Indiana Bridge Law of 1907, although county engineers generally have failed to appreciate it or to apply it as the law requires. Its application can best be shown by describing a bridge letting that was conducted contrary to this idea of the law, and by showing how its defects might have been remedied by a proper interpretation of the law by the county's board of engineers.

Early in 1913 it was decided to build a large bridge to replace one damaged by the Easter flood. A committee of citizens was chosen at a mass meeting to urge upon the board of commissioners a proper selection of type of structure. The committee of citizens and the county council were sufficiently influential to secure the appointment by the commissioners of a board of three engineers to act as the advisory engineers.

The county council agreed to appropriate the amount necessary to build the bridge, provided a permanent concrete bridge was selected. Evidently public sentiment up to that time was strongly in favor of a concrete bridge and the council was so determined to have a concrete bridge that they would not even make the appropriation available to the commissioners but promised to make it after inspection of satisfactory bids.

The advisory engineers employed a noted firm of designing engineers from outside the state to make a

complete detailed plan of a concrete bridge. These plans were placed on file as the county plans, and advertised for letting three weeks ahead.

Then came the fireworks! In that county seat was located a steel bridge company, an enterprising, influential, home tax-paying concern, with numerous stockholders among the citizens. The manager of this company was a distant relative of one of the majority commissioners. He employed the son of the other majority commissioner to come into his drafting room and design a competing steel bridge, with its outer girders encased in concrete, to simulate a concrete bridge. He began a systematic campaign in the newspapers against the county plans. His own plans were handsomely prepared black line prints, with printed specifications bound in leather, and a complimentary copy bearing the commissioner's name in gold was presented to each commissioner. These plans and specifications were placed on file ten days before the letting, as required by law. Several bidders examined the county plans, but were evidently discouraged by the insufficient appropriation that had been promised, and but one bidder finally qualified on the county plans. This bidder was an unknown in concrete bridge construction. Two bidders appeared on the steel bridge plans and the local firm was the lower of the two, although far higher than the bidder on the county plans and even above the promised appropriation.

The bids were referred to the advisory engineers, who made a report condemning the steel plans. The manager of the steel firm appeared before the commissioners and defended his plan and even had an altercation with the engineers. Numerous influential citizens were present to applaud the steel man. The minority commissioner afterwards stated that he had been appealed to by every moneyed man in town to vote for the steel design.

The commissioners held an executive session, considered the report of their engineers and **awarded the bridge on the steel design to the local firm.**

The county council met, received the report of the commissioners, who explained the overwhelming sentiment for the steel bridge design, and the money was appropriated and the contract signed.

Who was to blame for this situation? The steel bridge company, of course. Its manager is deserving of great credit for having faced an unfavorable situation and turned it to his advantage. To be sure, the will of the people was thwarted, but that was not his concern. His business was to sell the bridge, and he did it. Salesmanship is often a more serious problem than engineering.

But how might this situation have been prevented by the engineers? The Indiana Bridge Law reads (page 580):

"And it shall not be lawful for such board of county commissioners to make any contract for the construction of any bridge until a survey, profile and **general** plan have been deposited by such board in the office of the auditor of such county and open to public inspection from the date of the first advertisement for the letting of such contract."

And on page 581:

"Anyone desiring to submit plans and specifications for competition at the same letting may do so by filing the same with the county auditor not less than ten days before the letting."

Suppose now that this board of advisory engineers, instead of placing on file a complete detailed plan, had filed a general plan, as stated by the law, similar to the accompanying "sample drawing." The plans would show externals only, calling for those things that the county must have without any possible alter-

native, such as amount of waterway, width of roadway, elevations and grade of roadway, architectural appearance, including number and general arrangement of spans, but nothing whatever as to structural sections, leaving their choice to the bidder as one of various methods of securing **desired objects.**

Suppose these general plans had been accompanied by the usual specifications with the following clauses:

"Each bidder shall place on file ten days before the letting, as required by law, structural sections, completely detailing the proposed structure. Such sections shall conform in every respect with these plans and specifications. The contract will be awarded to the lowest bidder complying with these requirements.

"The fixed load is to be considered as consisting of all the filling, pavements, tracks, etc., between the arch and the proposed surface, estimated to weigh 125 pounds per cubic foot, and the concrete of the arch and spandrel at 150 pounds per cubic foot.

"The moving load is to be considered as consisting of a uniformly distributed load of 150 pounds per square foot, or a concentrated load of a 20-ton road roller and a concentrated load of 100-ton cars on two trucks spaced 22 feet on centers, in train and at high speeds, on each proposed track.

"The allowable stresses in material shall not exceed the following intensities:

Compression in concrete.....	500 lbs. per sq. in.
Tension in concrete not reinforced	0 lbs. per sq. in.
Shear in concrete.....	50 lbs. per sq. in.
Tension in steel	16,000 lbs. per sq. in.
Compression in steel not restrained	0 lbs. per sq. in.

Compression in steel restrained, ten times the compression in contiguous concrete.

"The allowable pressures on foundations shall not exceed the following intensities:

Rock	25 tons per sq. ft.
Hardpan	10 tons per sq. ft.
Coarse gravel cemented.....	7 tons per sq. ft.
Clay	3 tons per sq. ft.
Sand confined	2 tons per sq. ft.

"The contractor shall examine the proposed location and these plans and specifications, and by submitting a bid on them shall signify his approval of them and shall guarantee the proposed work for one year from completion against failure on account of any defects of design, workmanship and materials, said guarantee to be executed by a surety company bond equal to the contract, which bond must include a clause specifically setting forth the said guarantee."

These plans and specifications would have been adopted, for the steel manager had not yet started his campaign to upset public sentiment. Once adopted, the advisory engineers would have had complete control of the letting; for if the lowest bid met their requirements an award would almost necessarily follow. If the lowest bidder had submitted unsatisfactory sections the engineers' condemnation would have eliminated it. In such a letting the steel man would have found no fuel for his fire of criticism. His steel plan could not by any possibility qualify and an award on it could have been enjoined. The engineers would have remained complete masters of the situation from beginning to end. What matter if the particular details of construction might not be exactly what they would originally have planned? It is possible that they would be far better, for by this method competition would be encouraged among designing engineers, especially qualified as specialists, and the successful design would have the additional inspection and approval of the advisory engineers, now acting in their proper capacity of consulting engineers.

Moreover, by this method each bidder is required to have some engineering qualifications, thus eliminating some, at least, of the incompetents. For any bidder desiring to bid must prepare himself in advance, not by hiring a son of one of the commissioners, but by employing a competent designing specialist, if he is not himself competent. The incompetent who manages to get by this requirement will be eliminated by failure to secure approval of the consulting county engineer.

Thus the Indiana Bridge Law has in these two paragraphs the essential features of an ideal method of securing properly erected concrete bridges.

HOLLOW BLOCK RESIDENCE, WITH STUCCO EXTERIOR

The residence of Mr. E. W. LePlant, of Vernon Heights, Iowa, a suburb of Cedar Rapids, is located in the center of a large grounds with forest trees and a beautiful lawn, making it one of the most delightful homes in the city.



Hollow Block Residence, with Stucco Exterior. E. W. LePlant, Owner, Cedar Rapids, Iowa.

It is of hollow block construction, with exterior stucco of Medusa Waterproofed White Portland Cement. The first story walls are 16 inches thick with three air spaces, and the upper walls are 12 inches thick with two air spaces. The main part of the house is 40 ft. by 40 ft. with a sun parlor 12 ft. by 18 ft. on the east side, and a kitchen 12 ft. by 20 ft. with sleeping porch above, on the south side. There is also a commodious garage in the rear of the grounds of same construction as the residence, and on each corner of the grounds is an ornamental post 30 inches square.

Mr. LaPlant has had considerable experience in the building line, and he and Mrs. LaPlant designed their residence. The general contractor was H. F. Jones, and A. S. Kaufman did the stucco work, both of Cedar Rapids.

THE BIG BLAST HOLE DRILLING IN QUARRY OPERATIONS

Regarding the drilling and shooting of our material, we are pleased to report the following:

In the early part of 1913 we arranged with a well driller to drill some holes 5½ inches in diameter for us so that we might be able to experiment with the big hole method to determine before purchasing a big

hole drill whether or not our material could be handled to our better advantage by this method. After shooting a number of these holes the results were so satisfactory that we purchased a Big Blast Hole Drill, placing it into service in December of the same year. Since that time we have drilled 2,261 feet of holes and blasted the same. A comparison of the work done by the Tripod and Big Blast Hole drills is best shown in photographs taken. A large item of saving is being effected in the handling of this material on account of the stone being broken much finer, as chaining and blasting of this rock is eliminated and the wear and tear on the shovel is reduced to a minimum.

We are now in position to keep an abundance of broken material ahead of the shovel, which enables us to run our plant to its maximum capacity. As to the savings in our drilling operations, we formerly operated four tripod electric drills, and we are now doing the same amount of work with one Big Blast Hole Drill. The height of our quarry face is twenty feet. The material is an extremely hard black limestone and flint. In experimenting with the water well drill we

were able to make 20 or 25 feet per day. With the Big Blast Hole Drill we are drilling from 40 to 45 feet per day. Yours truly, Buffalo Cement Co., Quarry Operators, Buffalo, N. Y.

CONCRETE HOUSES FOR WORKINGMEN

A short time ago we referred to the fact that a number of small houses were being constructed of concrete at Midland, Pa., for the employees of the Pittsburgh Crucible Steel Company. It is interesting to note that these houses are 17x30 ft. in plan and are arranged with four rooms and basement. The living room is 15x16½ ft. in size and from it rises a 3-ft. stairway leading to the second floor. The kitchen is directly back of the living room and of the same size. The two rooms on the second floor are of the same size as those below.

The floors are of a 1:2:4 mixture of concrete with a double reinforcement consisting of ½-in. round rods spaced 9 in. each way.

The walls of the houses are reinforced with rods of the same size spaced 18 in. both ways. It is stated that the cost of materials and the "pouring" of each house did not exceed \$750.

Experimental Concrete Roads

By James T. Voshell

Prior to 1911, when Congress initiated the practice of making annual appropriations financing road investigations, the Office of Public Roads was only able to furnish laboratory aid and engineering to such communities as asked co-operation. Naturally study of the early experiments are valuable only as showing the steps by which progress was attained. In Ithaca, N. Y., the boroughs of Richmond and Queens, New York City, and Bergen County, N. J., concrete test roads were built. At Ithaca in 1909 a 4-in. roadbed was covered with oil asphalt—penetration 16.8 mm. at 25 deg. C.—in the proportion 1 gal. per square yard. Stone chips were added. By the following spring this coat was nearly worn away and subsequent applications of various bitumens have met the same fate. However, the concrete still receives an annual treatment. No transverse cracks have appeared and the pavement is in fair condition.

Mixing with Petroleum

During 1909 the Office of Public Roads conducted a series of laboratory experiments to determine the effect of mixing with ordinary concrete a residual petroleum at the rate of from 3 to 5 quarts per bag of cement. It was found that the strength of the concrete was not materially impaired, that it absorbed much less water and that the early shrinkage due to setting was much reduced. Experiments were conducted during 1910 and 1911 to test this material. Progress was made in the districts noted, but as the results are not striking attention will now be given to the experimental concrete sections in the Chevy Chase district, near Washington, built under the more generous Congressional subsidy.

A series of experiments was carried out in Montgomery County, Maryland, in 1912, to determine the relative value of bituminous concrete, cement concrete and the brick road surfaces when laid according to the best modern practice. These experimental sections, which had a total length of 6195 ft., were laid on Kensington Road beginning at Bradley Lane and extending to Chevy Chase Lake. The road has a double-track street car line down the center of it, and the section paved is a strip 20.5 ft. in width on the west side of the street car line.

In building the concrete section, 3,950 ft. in length, it was purposed to determine not only the relative value of concrete as a material for surfacing roads but the relative values of plain concrete and oil-cement concrete, the relative values of gravel, crushed limestone and crushed trap rock for coarse aggregate, whether or not expansion joints were necessary, and, if so, the proper spacing, and the relative values of various bituminous materials when used for a carpet or paint coat. The required sections were built without joints, except the construction joints.

The plain concrete was a 1:1 $\frac{3}{4}$:3 mix. This was supplemented by a residual petroleum oil in the proportion 5 pints per bag of cement to make the oil-cement concrete. The coarse aggregates ranged from $\frac{1}{4}$ to 1 $\frac{1}{2}$ in. in size. The sand was a good product obtained from the Potomac River. The concrete was mixed and placed by one machine, and was "struck off" and floated 6 in. thick.

To determine the changes in length of any section of the concrete road due to changes of temperature, brass plugs were embedded in the concrete, just before the final floating, in two rows 5 ft. from the edges of the pavement—one row with a 10-ft. spacing and the other with a 50-ft. spacing (see Engineering Record of July 19, 1913, page 76).

When the concrete had partly set it was covered with paraffined canvas, which remained in place until the concrete was hard enough for the surface not to be damaged by men walking upon it. The canvas was then removed and the concrete covered with a 2-in. layer of sand or earth, which was kept wet for a period of ten days. The construction joints were made by setting a header perpendicular to the subgrade and at an angle of 80 deg. with the center line of the road.

Occurrence of Cracks

When the sprinkling was discontinued and the concrete began to dry out, transverse cracks began to appear. The cracks did not appear at regular intervals, and their location was undoubtedly somewhat controlled by joints in a concrete gutter against which the pavement was laid. By the time the concrete had thoroughly dried out the cracks were an average distance of about 75 ft. apart. A few more appeared during the following winter, since which time none have developed. At present the average length of the monolithic sections is 43 ft. where gravel was the coarse aggregate and 121 ft. where crushed stone was used. The shortest monolith is in a gravel section and is 15 ft. in length, while the longest is a 220-ft. strip in the crushed-stone section.

Measurements have been taken from time to time between the brass plugs with a 10-ft. strain gage measuring to .001 in., and it has been found that the change in length per change of temperature, is, closely, that obtained by applying the factor for the coefficient of expansion of concrete and making a reasonable allowance for friction on the subgrade, showing that the concrete contracts more at the time of setting than it expands due to subsequent rises in temperature.

Of course the width of the cracks changes as changes in temperature occur, but ordinarily they appear to be from $\frac{1}{16}$ to $\frac{1}{8}$ in. in width. The largest cracks occur between the ends of the longest monolithic sections; those occurring at the ends of the 220-ft. monolith have an average width of about $\frac{1}{4}$ in. The maximum and minimum temperatures of the pavement so far observed were respectively 115 deg. and 25 deg. Fahr.; and the pavement shows no signs of having been damaged by this variation.

The edges of the cracks have been broken off to some extent by traffic, though not to such an amount as to be of much damage to the pavement. Those in the sections in which gravel was used as a coarse aggregate have broken off to a much greater extent than those in the crushed-rock sections, and all have broken off more than the edges of the construction joints in the same sections.

Tests of Surfacing

Last May a refined coal-tar, a refined water-gas tar preparation, a fluxed native asphalt and an oil asphalt were respectively applied to different sections of the plain and oil-cement concrete laid the previous November. The surface of the concrete was thoroughly cleaned by sweeping and washing and the bituminous materials were applied hot by means of a hand distributor at the rate of $\frac{1}{2}$ gal. per square yard, after which a layer of stone chips or $\frac{3}{8}$ -in. gravel was spread over the surface and rolled with a 5-ton tandem roller.

In addition to the eight sections above mentioned, bituminous materials were applied to two other sections of the concrete surface. The sections were cleaned as above described and the surface of one was painted with an emulsified native asphalt at the rate of about 1/10 gal. per square yard and the other with a light refined water-gas tar at the rate of about 1/5

gal. per square yard, after which a fluxed native asphalt was applied as above described at the rate of about $\frac{1}{2}$ gal. per square yard.

At the present time there is no apparent difference between the corresponding sections applied to the surfaces of the plain concrete and the oil-cement concrete. There is, however, a difference between the sections coated with the different bituminous materials. The sections to which the refined water-gas tar preparation was applied are in very good condition, as there are relatively few bare areas, the bituminous material is flexible and adhesion between it and the concrete surface is good. The refined coal-tar sections are in fair condition, but there are numerous small bare areas, and while adhesion between the tar mat and the concrete surface is good the tar appears to be rather "dead." The sections treated with the fluxed native asphalt and the oil asphalt are in good condition on the eastern two-thirds of the road, but on the western third there are a number of rather large bare areas. The asphalts are flexible, but do not appear to adhere well to the concrete surface. The section to which a paint coat of light refined water-gas tar was applied is in good condition—the bituminous materials are flexible, adhesion with the concrete surface is good and few bare areas occur. The section to which a paint coat of emulsified asphalt was applied is in fair condition on the eastern half of the road, while on the western half about 40 per cent of the concrete surface is bare. Adhesion between the asphalt mat and the paint coat appears to be poor.

A section 50 ft. in length was treated with a crude water-gas tar at the rate of about $\frac{1}{10}$ gal. per square yard. This penetrated the concrete to such an extent that the surface at the present time has a dark-brown color. There was not sufficient material to form a mat, and it does not appear that this treatment is of any value in protecting the concrete surface from wear.

Conclusions

From the experiments conducted by the Office of Public Roads the following conclusions appear to be justified: The surface of the road should be smooth and uniform, requiring rather wet concrete. The coarse aggregate should be relatively small, preferably one in which all of the particles will pass a $1\frac{1}{4}$ -in. screen. The concrete should be rich in cement in order that the mortar may be sufficiently strong and tough to resist the wear of traffic and to hold the particles of the coarse aggregate in place. Transverse contraction joints should be constructed, but expansion joints seem unnecessary. Particular attention should be given to the curing of the concrete by covering it and keeping it wet to insure that the mortar will have the essential qualifications of strength, hardness, and toughness, and that sufficient tensile strength may be developed, before initial shrinkage occurs, to prevent cracks from being formed between joints. These conclusions are only qualitative. It is hoped, however, that the experiments may eventually furnish sufficient data to warrant, at least, a few definite quantitative conclusions.

FREIGHT RATES ON CRUSHED STONE.

The Shenango Limestone Company of New Castle, Pa., has brought suit against the Buffalo, Rochester & Pittsburgh Railway Company claiming that it had an agreement with the railway company by which the latter was to charge \$2 per car for shipments, but that the rate was raised to 10 cents per ton, which made the cost of shipping more than double. The railway company's defense was that the switch of the limestone company's quarries is outside of the switching area of New Castle and that the company was, therefore, justified in charging the rates.

"SACKETT" BUCKETS AND DUMP CARS

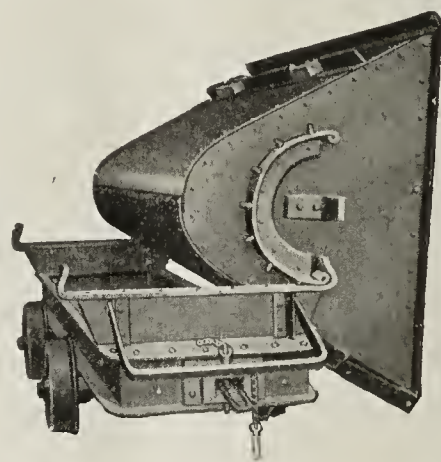
The H. B. Sackett Screen & Chute Company, 1679 Elston Avenue, Chicago has just issued a new catalog which they will gladly send to any of our readers illustrating and describing their contractor's tip buckets and automatic V-Body Rocker Dump cars. They write:

"We have attempted to show only a very restricted variety of the cars, buckets, screens, etc., which we manufacture. Our experience in this line and complete shop facilities allow us to design, construct and ship promptly anything of this character you might require.

"We also repair or overhaul and rebuild cars, buckets, screens, concrete mixers and machinery needing the attention of Sheet Metal Specialists."



"Sackett" Contractors' Tip Bucket. Self-dumping and self-righting. Automatically dumps when catch is released, and upon discharging rights end locks itself.



"Sackett" Automatic V-Body Rocker Dump Cars, used by quarry companies who want a heavy, easily handled car. The car is so designed that after the load is dumped the body rocks back automatically to its righted position. Built in capacities from 14 to 80 cubic feet for 18 to 48 in. gauge.

EIGHT-STORY CONCRETE WAREHOUSE

Plans are being prepared by Engineer C. A. P. Turner, of Minneapolis, for the construction of an eight-story reinforced concrete warehouse, for Bekins Van & Storage Company, at Twenty-second and San Pablo avenue, Oakland, California. Mr. Bekins of the San Francisco office stated recently that the plans would probably be received from the East within the next few weeks and that actual construction would begin the first of the new year. The building will be put up by day labor. There will be 175 feet on Twenty-second street, 180 feet on Brush street, and a small frontage on San Pablo avenue. The Mushroom system of concrete construction will be used. Walls, floors and roof will be concrete; windows will be wired glass with metal trim, and doors will be metal covered. The estimated cost is \$100,000.

The general offices of the company will be in this building, and several large concrete vaults with steel doors will be included in the improvement.

DUSTING OF CONCRETE FLOORS

Why is it that in two concrete buildings apparently constructed under identical conditions, built by contractors of equal intelligence and integrity, from concrete composed of similar aggregates and the same brand of Portland cement, the floors in one will turn out hard, firm and resistant to abrasion, while in the other ordinary usage will result in dusting sufficient to make necessary some remedial measures?

The fact that numerous dustless concrete floors have been laid seems to indicate that the trouble must lie in the selection, proportioning, mixing, placing or finishing of the material. The procedure and proportions described below have given excellent results, though undoubtedly different mixes have also been used with satisfaction.

time the concrete is mixed to the time that traffic is allowed on the floor is made a prime requisite for success. In all probability if the same care and attention are given to the workmanship and curing of floors in which no integral preparation is used, an excellent surface will result.

STONE SCREENINGS AS FINE AGGREGATE

Stone screenings as fine aggregate for concrete are not favored by the New York State Highway Department. As a result of some field tests of concrete in which all the fine aggregate was stone screenings, it was decided that the only allowable use of such screenings should be in conjunction with a much larger percentage of sand. It was found that a proper proportion of screenings from a hard stone will improve a



Reinforced Concrete Bridge at St. Paul, Minn.

Special precautions should be taken to insure first-class work. A rich mixture is desirable, say a 1:1:1 mix, in which the aggregate consists of granite, or other hard stone, screenings graded from $\frac{1}{4}$ in. in size down to the finest, and crushed stone of equal quality passing a $\frac{1}{2}$ -in. ring and retained on a screen having $\frac{1}{4}$ -in. mesh. All troweling and finishing of the floor surface should be completed within $2\frac{1}{2}$ hr. from the time the materials leave the mixer. This necessitates mixing the material for the wearing course to such consistency that the mortar has to be scraped from the wheelbarrows and will hardly flatten out when dumped upon the floor, yet wet enough so that it can be "struck off" with little difficulty when spread out with shovels. The floor usually is in a condition to be troweled for the last time within an hour and a half or two hours after the wearing course has been mixed. When sufficiently hardened to prevent pitting the floor should be sprinkled with water until 2 in. of sawdust can be thrown on the surface without injury. The sawdust should be thoroughly wet down and kept moist by sprinkling for a period of two weeks.

Numerous experiments in curing concrete have demonstrated conclusively the superior quality of specimens which are properly cured by being kept moist for a period of two weeks or more. Wetting is quite common with other types of concrete work and can be relied upon to give as satisfactory results with floors.

There are so-called hardeners on the market intended to be used with the finishing coat. In using these preparations careful supervision of the work from the

fine-grained sand but the high cost of proper inspection and mixing makes the use of such a mixture prohibitive, except where a good sand is very expensive. Laboratory tests of screenings as aggregate showed up much better than the above-noted field tests.

REINFORCED CONCRETE BRIDGE, ST. PAUL, MINN.

The bridge illustrated on this page is located on Mississippi boulevard near the Town and Country Club in St. Paul, Minn. The length of the bridge is 230 feet and the distance from the bottom of the ravine to the floor level of the bridge is 95 feet. The bridge has an independent rib arch and the floor is of a flat slab mushroom type. The treatment of the rib abutments and heavy portion of the work is a rough stipple concrete finish while the railing, lamp standards, etc., are of ornamental cast stone. The bridge abutments are hollow, thus requiring a small amount of material, at the same time giving the structure a massive appearance and furnishing sufficient lateral bracing. The walls of the abutments are 6 inches thick and steel reinforced. The heavy overhang of the cornice gives a very pleasing arch effect, somewhat unique in bridge construction. C. A. P. Turner of Minneapolis, Minn., was the engineer, and the F. J. Römer Construction Co. of St. Paul, Minn., executed the contract. Universal Portland cement was used throughout in the construction of the work.

New address Cement and Engineering News 672-673 Transportation Bldg., Chicago, Ill.

CEMENT STUCCO RESIDENCE

In the construction of residence for Wm. O. Goodrich, at Fox Point, Wis., the plastering contractor, August Bartelt, of Milwaukee, used Portland cement for exterior stucco with excellent results.

The building is furred with 1x2 inch wood strips, 16 inches on center, to which wood lath $\frac{3}{8}$ x1 inch were nailed, and exterior plaster applied. The first coat consisted of 1 part cement and 3 parts sharp sand, gauged with lime mortar and hair. This coat was scratched to form a key for the second or brown coat.

The second coat is $\frac{1}{2}$ inch thick and consisted of 1 part cement, 3 parts sand and a small percentage of lime mortar, and with this coat the walls were straightened. The second coat was also scratched or broomed to give it a key for the last coat.

The last or rough-cast coat contained 1 part Medusa white Portland cement and 1 part sand. This was

around the sand particles, preventing the adhesion of the cement. Washing is the remedy. While small amounts of some mineral clays or fine siliceous silts are known to increase the strength and densities, others commonly contain vegetable matter which is entirely injurious to the setting up of concrete.

In spite of the specified graduation up to a $\frac{1}{4}$ -in. size, much sand is used which has no coarse particles at all, or else it has too great an excess of fine material. Tests on Lafayette bank sands for density in a lean 1:6 mixture as to strength, determined by 2-in. compression cubes, indicate that the densest mortar and the strongest are given by the straight-line gradation of sizes of particles. In the determination of the density of 1:3 mortars, it was found that—the proportion of cement being constant—as a greater proportion of finer material is added to the coarser particles, the density is practically constant until the straight-line



Cement Stucco Residence of Wm. O. Goodrich, Fox Point, Wis.

applied with brushes by being dashed against the walls, and Mr. Bartelt arranged to have enough men working on one wall so it could be finished before any part set, thereby avoiding dry joints, which possibly might have been noticeable. The second coat was allowed to dry thoroughly before finish coat was applied. H. W. Buemming.

IMPORTANCE OF SAND TESTS

Failures in concrete are in many instances directly traceable to defects in the sand used. Hence the supreme importance of testing to determine the presence or absence of these defects. In a paper presented to the Indiana Engineering Society, January 23, 1914, Prof. H. H. Scofield, of Purdue University, Lafayette, Ind., classified defects in commercial sands which may cause concrete failures, under three heads—those having to do (1) with composition of the sand grain; (2) with the granulometric composition; (3) with the moisture content.

Of the first defect, hardness of the sand is an important item governing strength, and for that reason a high silica content is desirable. The grains should offer as great a resistance to shear and crushing as the cement does after attaining its best strength. The field test necessary to investigate these points is a critical examination, with or without a microscope; and this may not necessarily be exhaustive. Tests supplementing the ocular examination are needed. Organic acids may take the shape of a colloidal film

gradation is reached. After that, the addition of finer particles decreases the density. If a study of all fine aggregates indicates that the straight-line gradation is best, the application commercially is simply to make up a sand in which 100 per cent passes the $\frac{1}{4}$ -in. sieve and 50 per cent passes a No. 8 sieve.

Sloppy mixtures with standard Ottawa sand and good natural sands, lose 25 to 30 per cent of their strength, while poor sands may lose 70 to 80 per cent. This loss is explained as being caused by the greater dissolving action of the water, and, in connection with the abrasion of mixing, by the wearing-down of the softer, poorer particles, turning them into mud, thereby causing a decrease in strength and setting properties of the concrete.

CONCRETE FOR RELINING BLAST FURNACES

Concrete was used to reline the crucible wall of one of the blast furnaces of the Berkshire Iron Works, at Sheridan, Pa. After several tests it proved equal, if not superior, to fire clay. Concrete was made of 1 part cement, 3 parts ground fire brick and 5 parts of fire brick broken to sizes between $\frac{1}{4}$ and $\frac{1}{2}$ inch. This mixture was rammed into the bottom of the crucible wall for a height of one foot and used as a base for the brick work, the first two feet of which was laid in cement mortar. After seven months' use the concrete was still in good condition. Flues at the

Keystone Furnaces of the Reading Iron Co. have been relined in the same way, using a concrete made of cement and broken fire brick. Equal satisfaction has been experienced.

CEMENT STUCCO BUNGALOW

This attractive bungalow is one of many comfortable houses designed and erected by W. D. Shoupe in Chicago Lawn, Ill., a suburb of the city of Chicago. It is 48 feet long by 32 feet wide, with foundations of concrete and exterior stucco of Medusa Waterproofed White Portland Cement.

There are three well-lighted bed rooms with spacious closets, living room, dining room, kitchen, bath



Cement Stucco Bungalow of W. D. Shoupe, Chicago Lawn, Ill.

and linen closet. The building has three porch entrances, leading to the living room, dining room and kitchen. The painted surfaces are of dark brown which forms a pleasing contrast with the white stucco.

The entire space between the porches on the eastern frontage is occupied by the living room with its open fire-place and mantel, and on the outside is a built-in

CALIFORNIA CEMENT DEPOSITS.

J. Lansing Burrows, of Philadelphia, who represents one of the largest cement manufacturing concerns in the East, was recently in Porterville, California, according to press reports, to inspect the huge cement rock deposits in the foothills each of here recently secured by a Riverside concern. The deposits total 1,000 acres. Interests which Burrows represents have taken an option on the rock and he believes they will soon close for the purchase of the property.

CONCRETE BLOCK MAUSOLEUM

Properly made and neatly laid concrete blocks is

strikingly demonstrated in the construction of a mausoleum in Decatur, Illinois, and is of special interest to concrete block manufacturers.

Eight years ago F. J. Walters built a mausoleum 40 ft. by 110 ft. and 24 ft. high, containing 350 crypts, one receiving vault and chapel. Cement blocks thoroughly waterproofed with Medusa waterproofing and



Concrete Block Mausoleum, Decatur, Ill.

flower box of concrete directly beneath the living room windows. The general effect in the living room is greatly enhanced by the fire-place and hearth built of rough Roman brick with raked joint. The trim throughout is of oak.

This suburban residence cost \$4,000, and is a typical example of the charming homes that can be built at moderate cost with Portland cement.

faced with Medusa white Portland cement were used. The roof is of reinforced steel and tile imbedded in cement, while the interior is lined throughout with marble.

Those who have seen the work recently state that it looks better than when built, is elegant in appearance and shows remarkable durability.

ELECTRICITY THE CHIEF EXPONENT IN THE ECONOMICAL MANUFACTURE OF CEMENT

By W. Elwood Snyder*

There has been considerable agitation in the past few years, on the application of electricity as motive power in cement mills for economy, which has become a matter of great importance to the manufacturer, who is compelled, on account of the prevailing low prices, to economize in every possible manner.

The degree of economy ascertained by actual operation fully demonstrates the fact that electric motive power has passed the experimental stage, and warrants a safe and profitable investment for its permanent installation.

There is every possible opportunity for the manufacturers throughout the eastern part of Pennsylvania and New Jersey to gain another step towards the point of economy, some of them, however, wasted no time, but almost immediately took advantage of what might be called the necessary aid, which was presented by the erection of an immense electric power line through this section, which is now in full operation day and night, from which the necessary power can be procured.

A very comprehensive article on the subject of electric drive has been published in the January issue of the Cement and Engineering News, under the heading "An Analysis of the Benefits of Electric Drive in Cement Mills," by Thos. H. Arnold.

The cement manufacturer of to-day, however, cannot stop at the point of power economy alone, but is expected to take into close consideration the matter of progress for economy in the process of other departments of its manufacture as well. The present practice throughout the cement manufacturing world, which is a well known fact, is yet far from the desired degree of perfection.

Electricity applied for effecting economy in the process of manufacture in few words, however, is not degrading the standard of quality to gain the required results, which is so often the case when an attempt is exercised to gain the part of economy, over that of the actual normal possibility of the equipment of the plant, but on the other hand, for the purpose of reducing the cost of production.

A very good step towards economy in manufacture was gained when Thos. A. Edison in the fall of 1903 placed in operation the long kiln (150 ft.) installed in his plant at Stewartsville, N. J., and demonstrated the fact that they were entirely practical and effected the economy in the cost of production, which was an accomplishment that now benefits the manufacturers with the long kiln installation.

The small amount of additional power required to operate such kilns is more than compensated by the increased output, the reduction in fuel consumption per barrel, and the decreased cost of kiln-room labor over that of the smaller kilns.

A further degree of economy in the process of manufacture is at present rapping at every manufacturers' door, a prolonged hesitancy to response, will without a doubt add strength to the raps that may batter the bars to such a degree that might render it impossible to throw open at will, to welcome the desired and long waited for process, for which no doubt a continued decline pace of cement prices, and the continuation of the old process of manufacture will be responsible.

Mr. Edison, the first person in this country to attempt

the mammoth rotary kiln, has to an interesting extent effected the fuel economy in the manufacture of cement, but this department, however, is yet quite wasteful, in fact so much so, that it now becomes a vital necessity to make another step towards economy. This is a point that can be most readily ascertained by simply taking into consideration the approximate amount of fuel used, over that theoretically required to effect a complete incineration.

Approximately less than 50% of the heat developed by the combustible, is absorbed in effecting a perfect vitrification of the cement clinker, and the balance of the heat which is not lost by radiation, passes off with the kiln gases.

From the most reliable data available, the highest possible degree of temperature obtainable under practical conditions in the rotary kiln, using powdered coal as a fuel, is approximately 3,200 degrees F. at the highest point of combustion. And due to the fact that the process of burning in the rotary kiln, depends entirely on the radiation of the deflagrated zone, together with the reverberatory action of the upper half of the kiln shell, the temperature in the lower half or the part where the cement material is converted to clinker, is decidedly lower than that of the point of combustion.

The writer's experience in pyrometric measurement of temperature in rotary kilns, developed a conclusion that substantiates the fact that the required temperature at which the clinker is formed ranges from 2600° to 2900° F., the different degrees of temperature required to form a perfect clinker depends mostly upon the preparation of the cement mixture, which is a part well understood by the manufacturer.

The rotary kiln process of burning is perhaps not so economical as is in general thought to be, the immense cavity that must be heated with a combustible as above mentioned, is in no way concealed.

Improving or perfecting the conditions, it becomes necessary that a higher degree of combustible be substituted, and a concentrated area in which the cognate materials are burned be effected, together with a device by which this combination can be intensified at will.

The experiments carried out by the writer, clearly demonstrated the fact that such is a possibility, and commercially applied will effect economy by a large degree over that of the present process of burning.

In the first place electricity was substituted as a heating agent, which developed a temperature of 6,500 degrees F., applied in a special designed furnace, diminished in size approximately inches compared to that of feet in the rotary kiln, and with electromagnets so arranged as to send rays of electro-magnetic force down through the electric generated mixture, intensifying and accelerating the rate of heat absorption, and a perfect clinker resultant.

The raw material used in carrying out the experiment was taken at random from the feed pipe of a rotary kiln in the Lehigh Valley section, the clinker upon grinding has shown about the same degree of hardness as that of the rotary kiln, after mixing the ground cement with the required amount of water to bring it to the proper consistency, perfect setting and hardening qualities developed, after 24 hours in moist air, the pat was dropped in boiling water, and kept boiling for 10 hours, after which it was taken out and examined for soundness, the pat was perfect not even a hair line to be found that might bring suspicion of its soundness, this pat after having been exposed to the air for a period of ten years, is still sound and hard, equivalent in fact to the requirements of standard portland cement.

*Chemist. Expert on the manufacture of Portland and White Cement.

The object in view when carrying out these experiments, was principally for the purpose of providing a furnace to economize in the manufacture, and not for the purpose of raising any particular criticism.

In this furnace electricity constitutes the heat generative agent, and its design is durable and economical in construction and operation. The furnace as a whole, consists of a spider or spoked wheel, which carries an annular reservoir, from the bottom of which rises a vertical support carrying a continuous annular hearth with the top composed of carborundum bricks. The vertical support of the hearth divides the reservoir below into two continuous annular U-shaped compartments.

The hood composed of the same refractory material, suspends over the hearth, and the plates from the inside of the lower portion extend downward into the U-shaped compartments of the reservoir excluding the air which is undesirable at this point.

At intervals in the hood there are openings for the introduction of arc-supporting electrodes or carbons, the positive and negative carbons are arranged in sets respectively, and are staggered in such wise as to lay an arc across the entire width of the hearth. Each set of positive electrodes are provided with an automatic feeding device, advancing the carbons from time to time to preserve an arc of the requisite constancy of energy.

The hearth with its spider is rotated by the vertical shaft mounted in a bearing at the upper part of the furnace frame, and rests upon a ball-bearing shoulder of a threaded sleeve which is held in position by a threaded collar or wheel mounted upon a bearing, by rotating this collar or wheel the shaft is raised or lowered, which also raises or lowers the hearth thereby regulating the temperature required to produce a perfectly burnt clinker. By raising or lowering the vertical shaft the distance between the raw mixture and the electrodes is either increased or decreased, depending altogether upon the heat required to burn the particular mixture. While the hearth, spider and shaft act as one of the magnetic poles, the rate of magnetic force through the electric generated heats, is automatically controlled by raising or lowering the shaft, which increases or decreases the distance between the magnetic poles.

The continuous hood save for the space between its charging and discharging ends, is located a scraper disposed diagonally across the hearth and secured to the ends of the hood supports, and to prevent any portion of the calcined product from dropping into the reservoir at this point as it is scraped or diverted from the hearth, a stationary apron is secured to the ends of the hood, the lip of the apron extending partly beneath the hearth so that the calcined product removed from the hearth by the action of the scraper is discharged over the apron without blocking up the reservoir.

The inlet or charging end of the hood is closed with a slide save for the space necessary for the cement mixer to enter, near this end of the hood is located a stack which creates a draft drawing a continuous current of oxygenous air in opposition to the travel of the feed or cement mixture. The airtightness along the sides of the hood is obtained by the plates of the lower portion of the hood extending down into the reservoir containing a heavy liquid which effects the air-seal.

The cement mixture is deposited on the hearth by means of a notched feed-cylinder, which rotates in a casing below the hopper of the storage bin, laying the material on the hearth in detached portions, advantageous in the continuous operation of the furnace. A

continuous feed is not practical, it becomes vitrified into a more or less solid and continuous mass, which blocks or jams within the hood particularly at the exit or discharge end, where the product is turned off the hearth by the scraper.

The consumption of electrical energy as per experiments thus far advanced, represents a cost of approximately seven cents per barrel, with the possibilities of reducing this cost at least 20% under actual practical operation. The cost of burning a barrel of cement clinker by the present rotary kiln process, according to the best data obtainable ranges from twelve to sixteen cents per barrel depending upon the location of the plant together with the price and grade of coal used.

FREIGHT RATES ON CEMENT

This is a story of how the cement industry in Michigan offered to give the railroads of the state \$100,000 annually and the offer was rejected. Eight years ago the railroads attempted to raise the rates on cement. The mill owners went to the federal court in Detroit and obtained an injunction from Judge Swan. The matter lay dormant for about a year with the injunction in force. Then, in deciding another case, the supreme court ruled that a federal judge could not grant such an injunction. The mill owners went to the interstate commerce commission and the state railway commission and got favorable rulings from both of them. There has been litigation ever since, and in the meantime the freight rates on other commodities were mounting higher and higher, while the cement rate remained unchanged.

Last October the mill owners decided to end all litigation and offered to give the railroads an increase of 10 cents a hundredweight. The mill owners even had prepared charts and maps showing how the rates would work. It was too much for the railroads. They couldn't understand why such an offer should be made voluntary. After much examination of the charts they went to the state railway commission and asked for an increase of 5 per cent, half of what was offered. The increase was granted last Friday. Now the railroads are asking the mill owners to give them the previously proffered additional 5 per cent. But the mill owners say, "Nothing doing; you had your chance and you didn't take it."

The railroads' suspiciousness are costing them \$100,000 a year in lower rates on cement in Michigan.

CEMENT PLANT REPAIRS IN FENTON, MICH.

The repairs which have been in progress for the past few weeks at Aetna Portland Cement plant will be completed on or about March 15. W. E. Simmons, superintendent of the plant, says that the business for the new season will be commenced then and the plant reopened. The output of the plant for the years of 1913 and 1914 has been almost the same. The output has steadily increased since 1911. Two power engines are now in use and plans are being made to add a third. Within the last two years a new air pumping system has been installed and this is used to bring the marl from the machine boat to the mill. Within a few hundred feet of the Aetna plant is located the Egyptian cement plant and here, too, a general spirit of activity and work is prevalent. A large force of men is busily engaged in repair work and many changes have been made. Harry J. Paxton, owner of the New Egyptian Cement plant, has already paid out a large sum to both skilled and unskilled labor. The plant, it is expected, will open about April 1.

FREIGHT RATES ON CEMENT

A Washington dispatch says that the interstate commerce commission has held as excessive proposed increased freight rates on cement in carloads from Salt Lake City, Bakers and Devil's Slide, Utah, to Butte and Anaconda, Mont. The present rate on cement in carloads from the three points named, which has been in effect for five years, is 25 cents per 100 pounds to Gibson, Idaho, a point 151 miles north of Ogden, and this rate is blanketed to include Butte, Anaconda, Helena and the other points involved. The proposed increased rates start with 27 cents at Wapello, Idaho, 13 miles north of Gibson, and reach 30 cents at Payne, Idaho, 191 miles north of Ogden, the latter rate being blanketed to include all points north of Payne, to which the 25-cent rate now applies.

The testimony of the protestant, the Anaconda Copper Company, is that it places its large orders for cement for special construction work at Trident, and has, in fact, contracts with the company at that point which will absorb its entire output, and that it will be largely dependent for its ordinary, or month to month, supply on the Devil's Slide mills. In 1913 protestant ordered from Trident for special work 250,000 barrels of cement, the delivery of which has not yet been completed. During that year and in 1914 it purchased for its ordinary needs 83,000 barrels. Of these amounts about 8,000 barrels were shipped from Devil's Slide to Butte and Anaconda, the movement being between June 1, 1913, and July 31, 1914. The protestant insists that it will be unable to purchase cement at the Utah mills if the increased rates proposed are permitted to go into effect.

In deciding the case, the interstate commerce commission said:

"In referring to the earnings on cement from Devil's Slide to Anaconda, which, under the proposed rates, would be increased from 11 to 13.2 mills per ton mile, the respondents in their brief state that, 'standing alone, they appear to be high for the service performed,' but, as stated, seek to justify the increased rates on the ground of the difficulty of operation and a change in the conditions of competition which caused the establishment of the existing rates. Consideration of all the facts of record does not convince us that the respondents have sustained this burden, and they will be required to cancel the suspended tariff."

"CEMENT CONTAINERS"

Senate bill No. 10 proposes to require all Portland cement shipped to be inclosed in double bags. The industry is important and keenly competitive. The manufacturers claim that such a law would add \$1,000,000 a year to the cost of the cement produced in this State and that such additional cost would put them entirely out of all markets outside of this State. This is not impossible, for cement is now made and sold on a very small margin of profit and a difference of a few cents a sack in competition with concerns which do not use double sacks might easily shut us out of markets and reduce the number employed in cement making.

The reason assigned for the use of double sacks is that the escaping cement dust is injurious to health. It is even alleged that the cement when inhaled into the lungs becomes moistened and "sets" there.

If that be true it is certainly a serious matter. The result should show in the death rate of those engaged in the cement industry.

So far as we know vital statistics show the cement industry to be quite free from occupational disease.

and the death rate light. Such figures as we have seen show that, and we have seen none which show the contrary. It is a question of fact which the legislature will doubtless carefully look into.

If as a matter of fact cement dust when inhaled sets and hardens in the lungs it may be necessary to prohibit the manufacture of cement as we are virtually forbidding by a prohibitive tax, the manufacture of phosphorus matches. No such halfway measure as double sacking will answer the purpose.

For the only persons who will be helped by double sacking are those who load and unload cement into and out of ships and cars, and who occasionally in the discharge of their duty have to handle cement in sacks.

Those who work in cement factories every day and all day and are thus subject to constant instead of occasional exposure will not be relieved at all. Neither will the workmen who use the cement.

Evidently it is a matter to be carefully considered. It will not be desirable to confine our cement market to our own State, as it is alleged that the proposed law will do. And it is not a matter to be decided on ex-parte statements from a very small number of those having to do with cement, and then only occasionally. —San Francisco Chronicle.

TUBE MILL GRINDING

In the tube mills used in grinding cement at the Arrowrock Dam of the U. S. Reclamation Service, angular blocks of basaltic rock are being used instead of imported Danish pebbles. These blocks of basaltic rock are collected along the line of the Arrowrock Railroad and cost delivered at the mill only \$1.50 to \$2 per ton, whereas the imported Danish pebbles cost over \$26 a ton. It is stated that the basaltic pebbles have less breakage, wear longer and prove more effective than the Danish pebbles previously used. The corners and edges of the rough basaltic blocks wear off quickly and the blocks assume a smooth ellipsoidal shape after running in the mill from 12 to 18 hours. The difficulty in obtaining the usual supply of foreign pebbles for tube mills has compelled the use of local stones in many other places with varying degrees of success.

PENINSULAR CEMENT CO.

The annual meeting of the stockholders of the Peninsular Portland Cement Company was recently held. The financial statement for the year ending December 31 showed the company has had a very successful year, having manufactured and also sold more cement than any previous year since the company was organized. The directors elected for the ensuing year were D. C. Griffin, H. R. Scoville, John Senior, W. W. Hawley, J. W. Shove, C. F. Cowham, J. B. Hollhouse, N. S. Potter and H. Frank Stone.

The officers elected were J. W. Shove, president and general manager; D. C. Griffin, vice-president; C. F. Cowham, treasurer, and John Senior, secretary.

MAY MARK CEMENT BAGS WITH DATE OF FILLING

At the request of Henry C. Bourdingo of Bay City, Michigan, Senator Damon introduced a bill requiring manufacturers of cement to stamp on each sack of cement the date on which it was filled. The bill also provides that cement must be stored at least six inches from the ground. This provision is to prevent cement absorbing moisture.

PUT LIMIT ON CEMENT RATES

The Public Service Commission at Harrisburg, Pa., issued an order that the Lehigh Valley, the Jersey Central, the Delaware, Lackawanna & Western, the Iron-ton, the Lehigh & New England and the Bangor & Portland Railroad Companies establish joint rates of not more than 63 cents per ton of 2,000 pounds for the transportation of cement to Allentown from the Nazareth district, which includes plants located in or near Bath, Nazareth, Stockertown, Sand's Eddy and Martin's Creek. These rates are to become effective on or before April 10.

MARQUETTE CEMENT CO.

Marquette Cement Manufacturing Company, which held its annual meeting recently, reported net earnings on the aggregate investment of about 18 per cent. The company occupies rather a unique position, the amount of its outstanding capital stock being \$700,000 and its surplus or undivided earnings \$2,500,000. The company's stock is distributed among a very few shareholders and is very closely held. T. G. Dickinson is president, Stuart Duncan of LaSalle, Ill., is treasurer, and E. J. Dolton secretary. About 2,000,000 barrels of Marquette Portland cement are marketed annually.

CEMENT COMPANIES COMPLAIN

In a hearing before George N. Brown, examiner for the commerce commission, in the federal building today, complaints were made by the Atlas Portland Cement Company that it is being discriminated against by three western railroads. The railroads are the St. Paul, the Burlington and the Wabash. The company complained that through routes and joint commodity rates on cement shipments from Hannibal, Mo., were canceled by the railroads without just cause, and that the present rates are unreasonable. It is also stated that the railroads refused to restore the former rates, although through routes and joint commodity rates are allowed on shipments of other products than cement from Hannibal and on cement from competing mills at other points on the lines of these roads.—Chicago Herald.

CEMENT DUST

A physician testifying as an expert in the cement dust case in the superior court, declared that guinea pigs housed at the plant of the Riverside Portland Cement Company, in California, after being inoculated with tuberculosis bacteria, lived longer than those kept outside the cement zone, subjected to the same treatment. Dr. George E. Tucker, who gave this testimony, asserted that cement dust is of real benefit in cases of tuberculosis and catarrh.

CEMENT DUST ACT.

A bill requiring dust-proof containers for cement has again been introduced in the state senate by Senator Flaherty. The proposed law would compel manufacturers of cement to put their product in dust-proof bags for the alleged purpose of protecting the health of the workmen. It is estimated that the adoption of this law would cost the cement manufacturers of California \$90,000 annually to provide dust-proof lining for the cement bags. This is the same bill that was defeated in the 1913 session of the legislature.

PAY ROLL SYSTEM FOR A CEMENT PLANT C. H. SONDHHAUS.

In installing a pay roll system for a cement plant, it must be borne in mind that it is most essential to

secure absolute accuracy, therefore checks must be provided to insure against errors and fraud. The next important essentials are (1) securing of cost distribution, (2) simplicity and (3) a system so outlined that the pay roll can be worked up each day. This enables the accounting department to complete the payroll shortly after the last day of the period.

The method used by the Continental Portland Cement Co. offers a double check on the accuracy of the pay roll. By the use of the time clock system, the employees' own record of time worked is secured. This record is compared with reports made by the foremen of the departments. It is impossible for an employee to obtain more money than earned, unless he is in collusion with his foreman.

The system involves the use of the following forms:

- Foremen's reports.
- Timekeeper's daily report.
- Accounting department pay roll sheet.
- Time cards.

The foreman of each department fills out his daily report, showing man's number, name, hours worked and rate per hour. The foreman also states to what department the labor is to be charged. The report is then given to the timekeeper, who checks the rate and makes the extensions. He then recapitulates each report into departments, and thus obtains total charge to each department. These departmental charges are then written up on the timekeeper's daily report. This report is totaled and agreed with the total of all the foremen's reports. It is then ready to send to the accounting department.

The accounting department checks the extensions on the foremen's reports, also the recapitulating of the departmental costs, thus checking the correctness of the timekeeper's report. The foremen's reports are then posted to the payroll sheet kept by the accounting department. This sheet is quadrille ruled, the columns being numbered with the days of the pay roll period, and the horizontal lines being numbered with the employees' numbers, the names of the employees consequently being arranged numerically, not alphabetically. The employees' daily earnings, as shown by the foremen's reports, are posted in the column for that day. This column is then added, and agreed with the total of the daily timekeeper's report. After all the columns for the pay roll period are filled, each man's earnings are added and extended into a total wage column. The total of this total wage column is checked with the total of the daily columns.

Thus far we have a record of each employee's time, as given us by the foremen. Now against this record we check the time cards. The timekeeper totals and extends the rate and hours on each time card and sends them to the accounting department. The earnings shown by the time cards are checked against the earnings shown by the foremen's reports, as represented by the accounting department's pay roll sheet.

By the use of this system, the pay checks can be issued within two or three days after the last day of the pay roll period.

By reference to the daily report by the timekeeper, the treasurer is informed as to the amount of the pay roll upon the day of reference. He can thus estimate the total amount which will have to be paid on pay day and can provide funds for this purpose.

CLINCHFIELD CEMENT CO.

Amendment to charter of Clinchfield Portland Cement Corporation, Richmond, Va., increasing its capital stock from \$1,500,000 to \$2,000,000; providing for \$750,000 preferred and \$1,250,000 common.

VAN DUZEN GROUT MIXER

With the rapid development of permanent roads and bridges has come a remarkable evolution in the equipment with which to secure well mixed concrete at the lowest possible cost.

Engineers and contractors no longer talk of hand mixing because mixer manufacturers have more than kept abreast of the times and offer all sizes, combinations and grades of mixing equipment.

Experience having proven that in many instances the large machines put the cost too high, many "split sack" mixers have come before the trade. Those founded on correct mixing and mechanical principles and made by reputable firms have come into a well earned popularity.

The Van Duzen grout mixer shown on a brick pavement is perhaps the last work in split sack power driven mixers for general road purposes. In the East it has even supplanted the one and two sack pavers where a contractor has found that the investment for two of these little pavers is less than for one of the heavier type and that by pitting one crew against the other as they go down the subgrade, greater yardage is obtained at no sacrifice in quality of output. However, the two-way traction end discharge mixer with open

fins, thereby eliminating balling or clogging of the grout or concrete.

A revolving spout pivoted under the point of discharge assists the placing of the concrete at almost any point desired.

The drum is gear driven from any engine which the purchaser may specify. This conical drum resting on the yoke and angle, well supported by completely housed balls as bearings, helps largely to protect the Van Duzen mixer's reputation as a no-stop, no-delay mixer. All parts are fully guaranteed and every effort is made to have each purchaser fully satisfied and getting full capacity from his mixers.

By specializing on small mixers exclusively, by keeping the plant overhead charges and selling expenses to a minimum, the Van Duzen-Roys Co., fourth floor, Hartman Building, Columbus, Ohio, has been able to place a large number of these machines. Local sales agents are about to put forth an aggressive campaign for the small paver and grout mixer business. The opening of this heretofore untouched field of highway work promises more bidders on small work and better prices as contractors become acquainted with the possibilities of such self-contained mixing units.

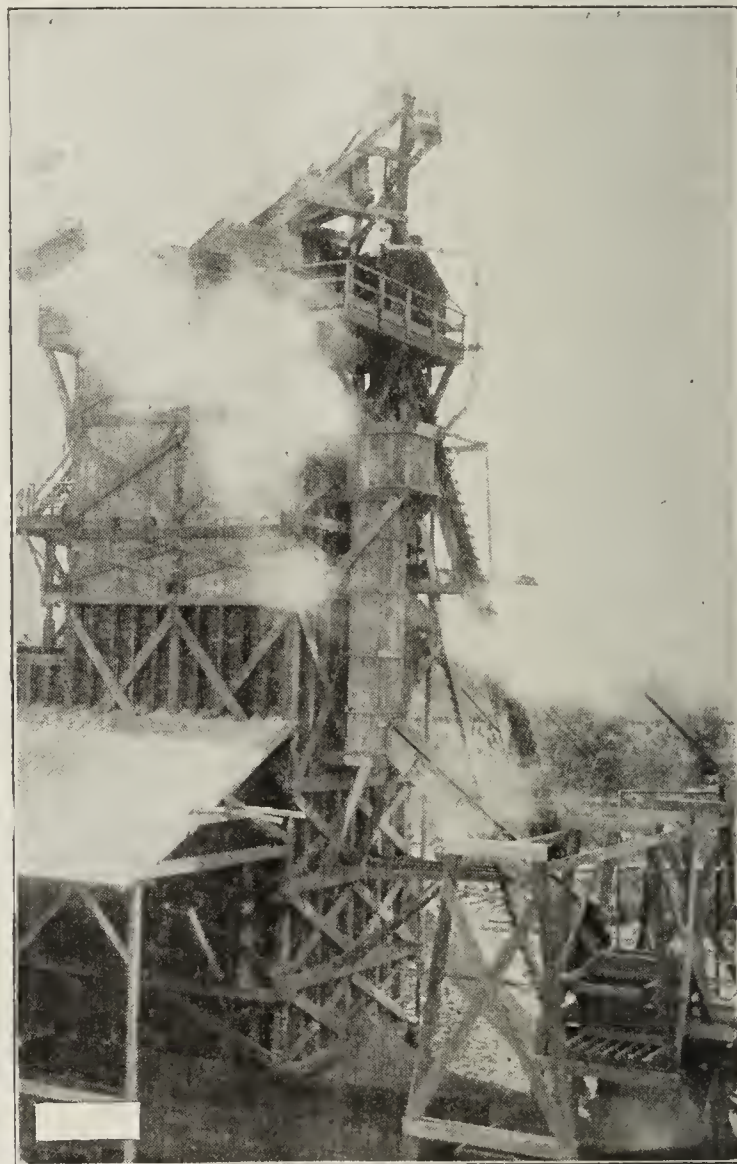


Gravel Washing Plant of Barton Sand & Gravel Company, Barton, Wis.

Ultimate Capacity, 40 Cars Daily. Consists of Shearer & Mayer Drag-Line Excavator, Conical Washing Screen, Settling Tanks, No. 5 Tel-smith Primary Breaker, 125 H. P. Steam Boiler, Corliss Engine, Etc. The T. L. Smith Company, 3136-B Hadley Street, Milwaukee, Wis., prepared the preliminary designs and furnished the excavating, crushing and elevating equipment.

end power loader and two-way water tank was designed primarily as a grout mixer for brick pavements.

Freedom from all complicated or inaccessible parts characterizes all of the mixers made by the Van Duzen manufacturers. The steering gear and all clutches are in reach of the operator. The amply large open-end skip performs its function quickly and without clogging. The rounded bottom bowl type of drum receives the materials as shown in the illustration. The revolving drum is then inclined towards the rear of the machine and a quick discharge is effected as the emptying is on the same principle as dumping a pail of water. Three properly placed blades, or plows, set one inch above the sides of the drum, insure a proper mix and yet allow the water to circulate under these



The Shearer & Mayer Drag-Line.

Cableway Excavator, furnished by Sauerman Bros., 1139 Monadnock Block, Chicago, in operation in the plant of the Barton Sand & Gravel Company, Barton, Wis.

UNIVERSAL CEMENT CO.

Announcement has been made by the Universal Portland Cement Company that Charles S. Fletcher has been appointed manager sack bureau, Oscar N. Lindahl has been appointed chief accountant and Gordon Wilson has resigned as assistant secretary to accept service with another company.



Smith Mixerette Facts and Figures

The Bleicher Concrete Co., Kenosha, Wis., purchased the first Smith Mixerette that was built. Here's what they have to say about their machine and some of their records as given in their letter of October 26th, 1914.

"We bought one of your Smith Mixerettes six months ago and find it to be a great labor saving machine. With three men we are able to put in 1,000 square feet of sidewalk in 9 hours with the aid of your mixer. Recently I put in a foundation 35 ft. by 42½ ft. by 1 ft. (55 cu. yds.) with your Mixerette in 9½ hours.

"It is a wonderful machine and I can recommend it to any one desiring to reduce their labor expenses, for I know how much can be accomplished with it."

This dandy little mixer holds a five-foot batch of dry, loose material, 3 cu. ft. of mixed concrete. It will easily turn out 5 cu. yds. per hour.

Compared with other five-foot mixers, the price of the Smith Mixerette is as low or lower and back of it is the guarantee of the biggest concrete mixer manufacturers in the country.

\$128.00 on skids with pulley and feed chute.

\$246.00 on steel truck with 2 h. p. gasoline engine, steel house and low charging, gated batch hopper.

\$315 on steel truck with 2 h. p. gasoline engine, steel house and ground level power charger.

Get all the data by filling in and mailing the Coupon for Mixerette Proposal and Booklet No. 107-B.

MAILING COUPON

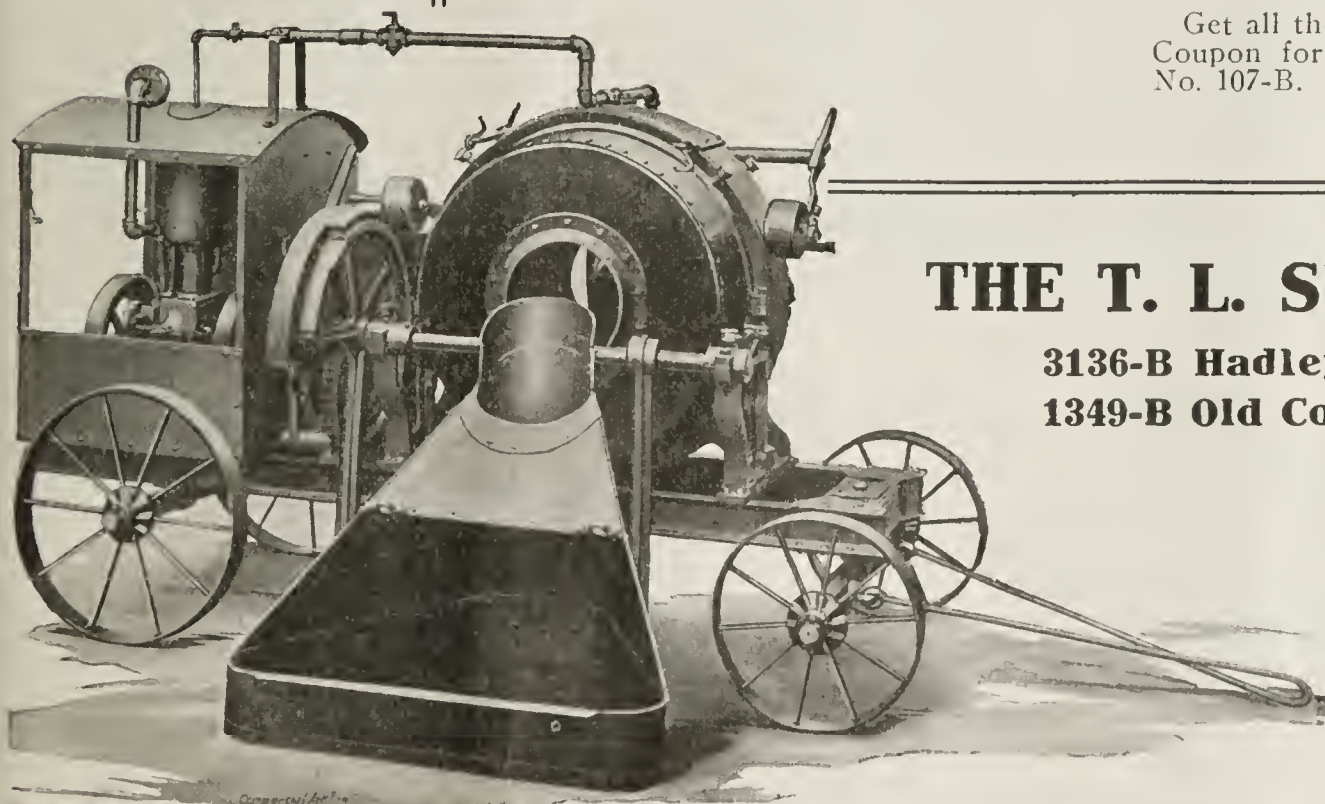
Send me, without any obligation on my part, SMITH MIXERETTE Proposal and Booklet No. 107-B.

Name.....

St. Address or P. O. Box.....

City..... State.....

NOTE—Fill in this coupon and mail it to either address given in this advertisement.



THE T. L. SMITH COMPANY

3136-B Hadley St., MILWAUKEE, WIS.

1349-B Old Colony Bldg., CHICAGO, ILL.

**THE CHAS. A. SCHIEREN COMPANY
LEATHER BELTING EXHIBIT**

In Machinery Palace, Panama-Pacific Exposition

There are very few people who realize how many problems confront the user of belting.

Limited space on many machines compels the use of narrow belts.

Positions of shafting and machines to be driven and numbers of other unlooked for difficulties must be met, but when you have studied the practical demonstration of different forms of drive as shown in this exhibit of Schieren's you will agree that there is noth-

quality and workmanship. A guarantee that the leather is of A-1 centrestock-Packer-Steer-hides, cement perfect, and workmanship of the first order.

If any stamped Duxbak does not come up to this high standard it may be returned to Schieren and the price refunded—but we have not yet been able to find a case when any but very minor defects escaped the watchful eye of our inspectors, and each man in the Schieren employ is in a way an inspector—we train them that way. It helps a whole lot to keep up the standard we set.

The belting shown in the half-tone herewith is, of



ing like belt-driven machine where belt machines are in a fixed position.

You know belting has greatly improved in recent years. When Schieren invented the process that this company uses in making Schieren's Duxbak Waterproof Leather Belting he made a "Seven-League Stride" in the right direction. Duxbak belting is able to keep its shape and size in all climates and under any manufacturing conditions it may meet, from the hot, dry air necessary in some cases to the wet, sloppy paper mill, dye works or metal mills.

All Schieren Duxbak Beltings are made this way—air, fume and waterproof.

The Duxbak trade-mark is a stamped guarantee for

course, the important thing, but the booth itself is interesting; for this reason we give a list of its many features.

The booth of Chas. A. Schieren Company is located up a corner 31 ft. by 31 ft.

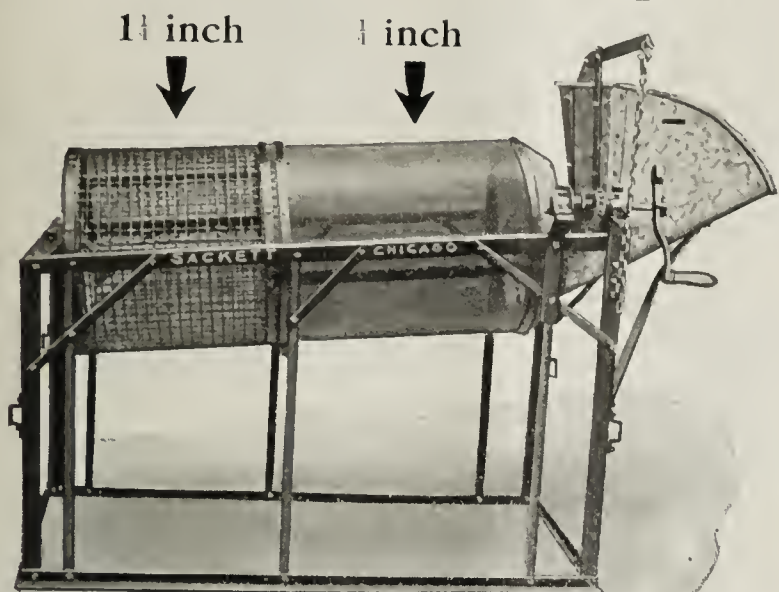
The floor plan of the booth is an octagon in form, whose parallel sides are 20 feet apart.

The floor of the booth is 18 inches above the floor of the hall and rests upon a substantial iron frame work, whose main supports rest upon a masonry foundation.

Four columns made of angle iron riveted together and covered with sheet iron support the octagon-shaped base of the dome.

The columns are anchored to uprights in the

Bank-Run Gravel seldom has the right proportions



Since there is usually too much sand in proportion to the pebbles, *Cement is Saved* and a better concrete obtained by screening the sand from the pebbles and then remixing them in the right proportions. All pebbles larger than $1\frac{1}{4}$ inches are usually discarded. All material less than $\frac{1}{4}$ inch is considered sand.

A Sackett-Rotary does this in one operation for you.

Send for our Special Screen Circular.

H. B. Sackett Screen & Chute Co.

Main Office and Shops
1679 Elston Ave.
Chicago.

Branch Warehouse
195 Medford St.
Charlestown, Mass.



Our Molds and Construction Patented

Use Peerless Silo and Peerless Wall Molds

Peerless Silo Molds are the largest daily capacity molds on the market, building $7\frac{1}{2}$ ft. daily, including chute, with same labor and cost as others build 4 to 6 ft. This means 3 to 5 days labor expense and time saved on every silo. It means one extra silo every month, the profits from which will PAY for a Peerless Mold in one season. THINK THIS OVER, and write for Peerless particulars.

Use Peerless Wall Molds and stop wasting lumber. Barns as well as silos should be of concrete. HERE IS TO THE ALL CONCRETE FARM BUILDINGS. Ask us about them.

New Enterprise Concrete Machinery Company

68 W. Monroe Street

Chicago, Ill.

Stop Shoveling Your Profits Away



Get the Time-Saving, Substantial, Reliable, Economical Van Duzen Mixer, with or without side loader, used by hundreds of large and small contractors. Capacity 50 to 80 yards per day. Both the Price and Cost of Operation will surprise you.

Manufactured under Basic, U. S. Letters Patent
Jan. 24-05, Feb. 14-05, Jan. 29-07.

Our catalog fully describes these machines

The Van Duzen-Roys Co.

4th Floor, Hartman Bldg.,

Columbus, O.

BLOCK MACHINES

Face Down Handles Wet Mixture

**CEMENT BRICK
MACHINES**

Hand Power; also Power
Brick Machine; 60,000 tamped
cement brick per day

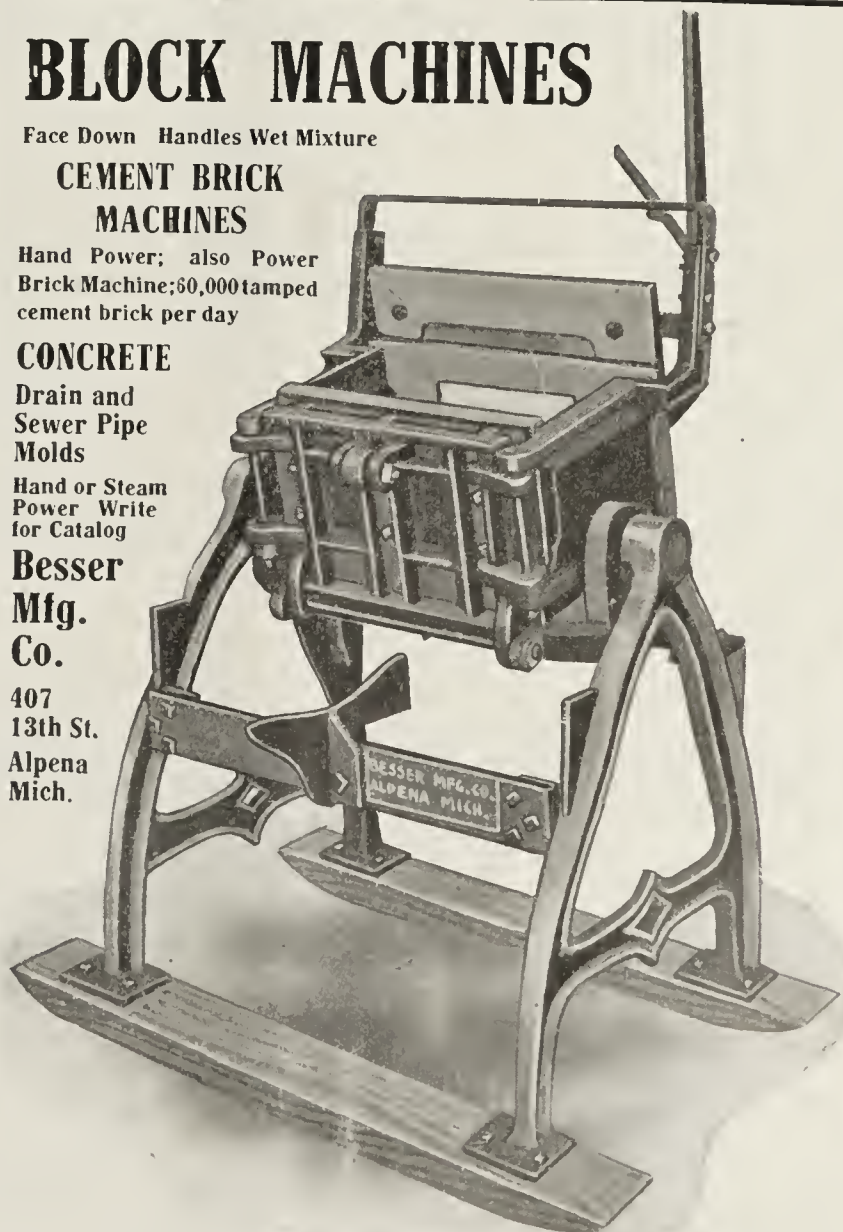
CONCRETE

Drain and
Sewer Pipe
Molds

Hand or Steam
Power Write
for Catalog

**Besser
Mfg.
Co.**

407
13th St.
Alpena
Mich.



masonry foundations, and are built with a strength commensurate with the load of the dome and machinery.

In the center of the booth is placed a basin 6½ feet in diameter, with a fountain.

Connection with the water main is provided for supplying the basin. The water from this basin flows to a small centrifugal pump, which forces a stream up through the fountain.

Upon the dome a Schieren belt 190 feet long is arranged in a spiral, bearing the firm name of Chas. A. Schieren Company.

This belt is illuminated by 110 concealed lamps of 50 candle power each. And 29 lamps of 50 candle power each illumine the interior of the booth.

The lamps are so distributed in sections as can be seen from the wiring plans, that the different sections are proportionately loaded.

In the booth machines and belt drives are shown, intended to demonstrate the application of Schieren Belting to interesting drives.

A 5.4 3-phase motor of 1,440 revolutions per minute drives shaft No. 1 by means of a Lenix at 360 revolutions per minute.

The rheostat has an automatic switch, which may also be worked from one of the corner columns.

Shaft No. 1, by means of an overhanging pulley and two guide pulleys, drives a centrifugal machine.

It also drives, by means of a belt, shaft No. 2, the belt running over a fixed idler pulley and a Lenix.

The centrifugal machine runs at a speed of 1,080 revolutions per minute, and this belt drive is especially characteristic and interesting.

Shaft No. 2, running 180 revolutions per minute, drives from one end a planer by means of a Bamag countershaft (with two pulleys) at 1,200 revolutions per minute.

On the other end (of shaft No. 2) it drives shaft No. 3 at 60 revolutions per minute by means of a quarter turn belt arrangement with automatic tightener.

A cement tube mill grinder of 60 revolutions per minute is driven by means of a simple countershaft.

From the friction clutch pulley on shaft No. 3 a belt running over mule pulleys leads to a vertical shaft, from which the vertical shaft for the Lenix drive in the water basin is driven.

A duck, representing the trade-mark of the firm, is fastened to the belt, which runs permanently in the water.

From shaft No. 2 is driven also a centrifugal pump, which serves the fountain.

On two sides of the booth, at a distance of 2 meters, are located two substantial platforms, 76 feet by 1 meter wide, exhibiting various transmission appliances.

When you visit the "Fair" make it a point to have a chat with our men, writes the Charles A. Schieren Leather Belting Company, in charge of this interesting and instructive exhibit, and if you wish any belting information, no matter whether you use our belts or the other fellow's, all you have to do is to ask and you will likely hear something of profit to you.

We are determined that we will do our little all to help make this an exhibition of not only things for the eyes, but the ears as well, if you give us a chance.

STANDARD CEMENT CO.

The Standard Portland Cement Company has received an order for 65,000 barrels of cement to be used in the construction of extensive warehouses and terminals to be built at New Orleans.

The cement will be shipped from the company's plant at Leeds, Ala., and the first shipment, which will consist of 200 carloads, will go forward this week.

The reception of this big order is in line with the extensive business which the company has been doing. Its large plant has been running night and day and Sunday for some time.

J. I. McCants, sales manager of the company, who secured the big New Orleans order, is recognized as one of the most successful cement men in the country.

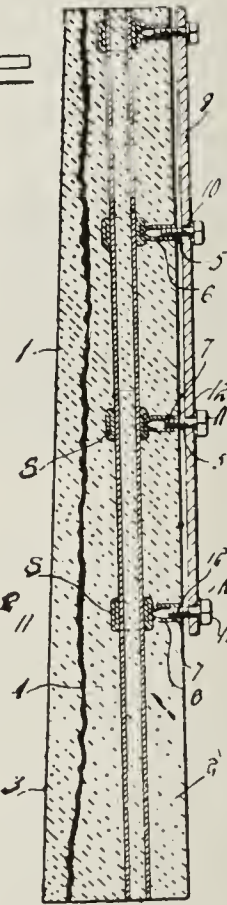


Rectangular concrete tanks are a little easier to build than circular tanks, especially if the farmer builds his own forms. On the farm of Tom Campbell, Vincennes, Ind., is a good example of a rectangular barnyard tank shown above. Water froze solid during the first winter of its service but the trough was not injured. The ice pushed upward without causing harm.

The Post that Will Not Rust, Rot, Break or Burn, but Gets Better Every Year

PATENT NO. 1,107,408

FIG. 2



SERIAL NO. 829,291

THE UNIVERSAL CEMENT POST

is the only cement post to which a plank fence may be attached without the use of a single nail. It is the only cement post which holds the fence in such a manner that it is impossible for cattle to ride it down, or hogs to go under it.

Further, it is the only cement post for building speedway and ball park enclosures; fastening of boards is an easy matter.

This post will not break at the ground. Our special process of reinforcing takes good care of that part. Can be made in any shape, design or length to match any design one may want to carry out.

The Universal Cement Post is the only all-feature post on the market. Large corporations want this post. A live state agent is wanted to take care of the demands for this post in each state and Canada.

My mutual plans will be profitable to all concerned. Write at once. Address all correspondence to

F. W. GOTTLIEB

General Agent
MORRISTOWN, INDIANA

THE LOW DOWN FORCE FEED MIXER



has a capacity of from 4 to 12 cu. yards an hour with a forced feed and stroke off measurement different from all others. It gives absolutely perfect proportions whether the materials are wet or dry. Cannot clog. You can set and lock the feed gates so there will be no variation.

Few parts, open-to-view mechanism and low down hoppers make this mixer economical in operation and upkeep. Feed can be changed without stopping the machine. Safety friction clutch enables you to stop or start the machine without stopping the engine. Construction perfect. Price remarkably low.

Find out more of the Low Down's good features. Send for Catalog "B," which gives detailed information. Mention Cement & Engineering News when writing.

ELITE MFG. CO., Ashland, Ohio

The HARDING MORTAR MIXER Successfully Mixes Hard Wall Plaster and Brick Mortar

The sensation of the Chicago and Omaha Cement Shows was the rapid, successful and thorough mixing of hard wall plaster with hair and fibre, lime mortar and Portland cement with the Harding Mortar Mixer. We mixed the actual material for the "show me" type of contractor, and made good with him.

With this Mixer you save the wages of one to six laborers on every job. One laborer can do the work of four; two men can do the work of eight.

You save one-quarter of your material bill. Thorough mixing permits use of more sand.

You get perfect mortar, impossible to get mixing by hand. Machine mixed mortar is uniform. It spreads easier, hangs together better and sets harder.

You make a good mortar man out of any laborer.

You have Mortar all the time, and exact amount to last you until quitting time. The machine is fast. A batch can be dropped out in ten times the time the material could be mixed in the box. Write us for proof from Contractors and details now. Sold on Free Trial.

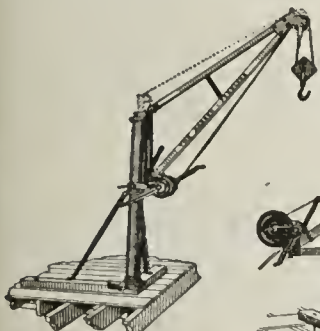
Architects are beginning to specify machine mixed mortar. An exceptional proposition for representatives in unoccupied territory.

The Mortar Mixer Corporation

700 Washington St.,

Iowa City, Iowa

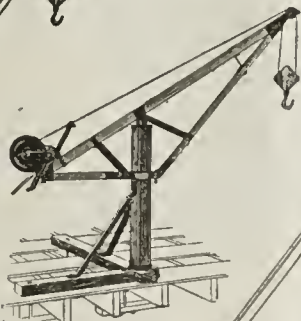
MOST COMPLETE LINE OF BUILDERS' DERRICKS



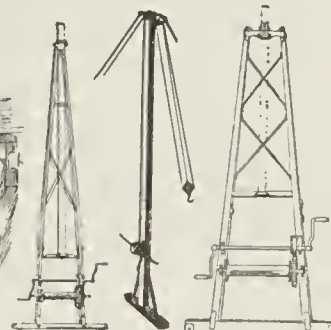
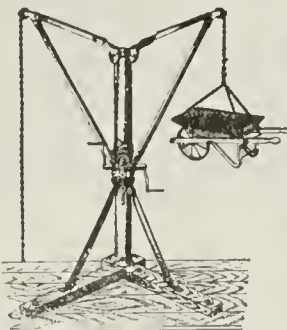
Sasgen's is the oldest derrick house in the country. We make the strongest, best and most reasonable price derricks.

SASGEN DERRICK COMPANY,

WRITE FOR CATALOG No. 15



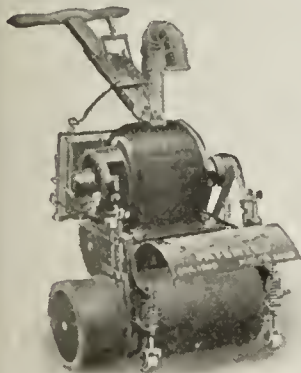
STIFF
LEGGED
DERRICK



We manufacture Steel and Wood Circle Swing Builders' Derricks, hand and power, Pole-Setter, "A" Frame, Double Boom Wheelbarrows, Stiff Legged and Guy Line Derricks, Single and Double Drum Geared Winches, Blocks, etc.

2052 North Racine Avenue, CHICAGO

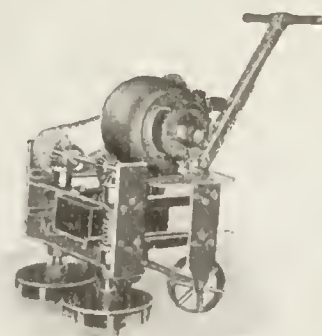
TEST AND TRY BEFORE YOU BUY The Schlueter Rapid Floor Surfacer



The Schlueter BALL BEARING electric floor surfacing machines for mosaic, marble, composition and wood floors are the most simple constructed machines on the market. Direct chain drive AUTOMATIC DUST COLLECTORS. No gears or clutches to wear. Made in various styles.

OVER 5,000 IN USE ALL OVER THE WORLD

Send for prices and free trial proposition



THE M. L. SCHLUETER CO.

225 W. Illinois Street, CHICAGO

CONCRETE GREENHOUSE TANKS AND BENCHES

Progressive florists are discarding their wooden greenhouse tanks and benches as rapidly as practicable and substituting those of everlasting concrete. Lumber, even cypress, when subjected to the moist conditions existing in the greenhouse, must be renewed every few years, while concrete work can be done very successfully and cheaply, and is acknowledged to be the most economical, especially on account of its permanence.

The view herewith is of tanks in the greenhouse of William Tricker, Arlington, N. J. On the side of the greenhouse the tanks run the entire length of the house which is 100 feet, there being four tanks each 25 feet in length. They are elevated to the height of 30 inches and are 3 feet in width. The thickness of the side and end walls is $1\frac{1}{4}$ inches and the bottom 2 inches, and inside depth is 6 inches. The tanks were cast in place upon precast legs, and mixture used was

thickness of the wall of the center tank, and the side tanks which were constructed by us. The walls of the center tank are 9 inches thick as compared with the thickness of $1\frac{1}{4}$ inches for the tank in which Medusa Waterproofing was used. The large tank even with this wall thickness shows many leaky places and Mr. Tricker advised us that probably next spring he will tear it out and replace it with one of better construction. The system which we used in the erection of these tanks is the same as that employed in the construction of our concrete greenhouse benches, except in the tanks of course, we placed no drainage slots. The form of bench and system of construction are known as the Wilson-Hoyt patents which we control in the United States."

FREIGHT RATES ON LIME

Prospect of a big reduction in freight rates on pulverized lime used as fertilizer, resulted from a conference held at the offices of the utilities commission



Concrete Greenhouse Tanks and Benches.

4 parts of coarse sand to 1 part of cement, containing 2 pound (2%) of Medusa Waterproofing to each sack of cement.

The Mead-Suydam Company, 371 Park avenue, Newark, New Jersey, manufacturers of concrete specialties, built these tanks or benches, and we can add nothing more interesting than to quote from their letter of Dec. 1, 1914:

"The elevated tanks in Mr. Tricker's greenhouse were constructed by us and demonstrate to our satisfaction that Medusa Waterproofing does make concrete impervious to water, and we are pleased to say that we will gladly recommend and use it whenever such a material is required.

"These tanks were built last April and have been kept filled with water ever since that time. On last Monday our President, Mr. F. J. Mead, inspected the benches and found no sign of moisture on the outside of the walls or bottom. These benches are used by Mr. Tricker in growing aquatic flowers, particularly water lilies and grasses and plants for aquariums.

"In the photograph you will note the contrast in

at Columbus, Ohio, by farmer members of the legislature and fourteen traffic officers of railroads in Ohio.

Representative O. J. Thatcher of Clinton, who called the conference, was told by the railroad men that this was the first time in history that farmers had sought to confer with railroad officials for the mutual benefit of the farmers and the railroads.

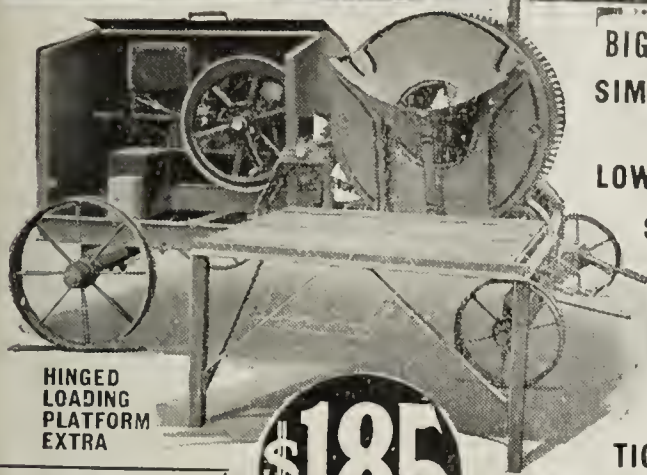
The farmers asked a lower rate on the same ground that a preferential rate is given blast furnaces on fluxing stone, which is used to produce an immense quantity of high-class freight.

It was shown that a top dressing of lime adds 10 bushels per acre to the yield of corn, adds more to the wheat and rye crops, doubles the yield of timothy and is a necessity for alfalfa.

Every county uses lime fertilizer, but it was shown that in some sections the rate is prohibitive, shipments infrequent and the service bad.

The traffic men agreed to name a committee to handle the complaint, and the farmers left with practical assurance of a big cut in the rate.

The Mixer Sensation Of The Chicago Cement Show



HINGED
LOADING
PLATFORM
EXTRA

BIGGEST IN QUALITY
SIMPLEST IN CON-
STRUCTION.
LOWEST IN PRICE.

SEMI STEEL GEARS.

WICK OILING
BOXES.

BATCH A MINUTE.

SAME MIXING AC-
TION AS BIG PAVERS.

\$185

Owners Say

S. W. HILL & SON, MINN., SAY: Mixes fast and thoroughly. Every body likes the mixer. Batch hopper measures fine, etc.
W. H. BOROUGH, OHIO, SAYS: We investigated all mixtures; glad we bought the Packard. 3 H. P. engine a success. Cut mixing cost 30 per cent, etc.
F. O. ENNIS, MINN., SAYS: Have tried it (the Packard) on all kinds of work. It does its work easy and quick. It is built to last, and is simple and handy. It is easy to move over any kind of roads. I think anyone buying a mixer would save money by getting a Packard.
H. L. WATERS, ILL., SAYS: Have used it in all kinds of concrete work and find it turns out more concrete than some large mixers here. The commissioners think the mixer is the best piece of machinery we have.
Hundreds of other letters, names, addresses, etc., on application.

BUYS

THIS FIVE FOOT CAPAC-
ITY MIXER COMPLETE.
BIG 3 H. P. ENGINE,
STEEL ENGINE HOUSING.
LOW CHARGING BARROW
HOPPER, ALL ON STEEL
TRUCKS. POWER LOAD-
ER, MEASURING WATER
TANK, BATCH HOPPER,
EXTRA HOIST CAN BE
FURNISHED.

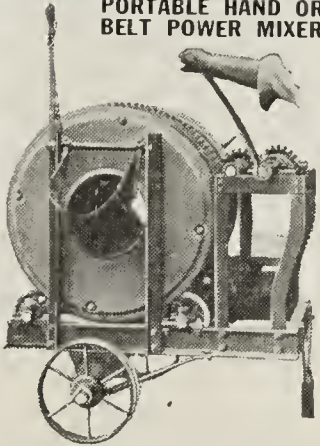
SOLD ON TRIAL, CASH
OR PAYMENTS. WRITE

**CONTRACTOR'S
MACHINERY CO.**

130 11th ST., KEOKUK, IOWA

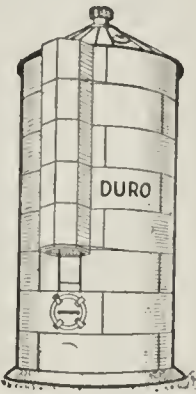
SPEED QUALITY
Packard
HAND AND POWER MIXER.

PORTABLE HAND OR
BELT POWER MIXER



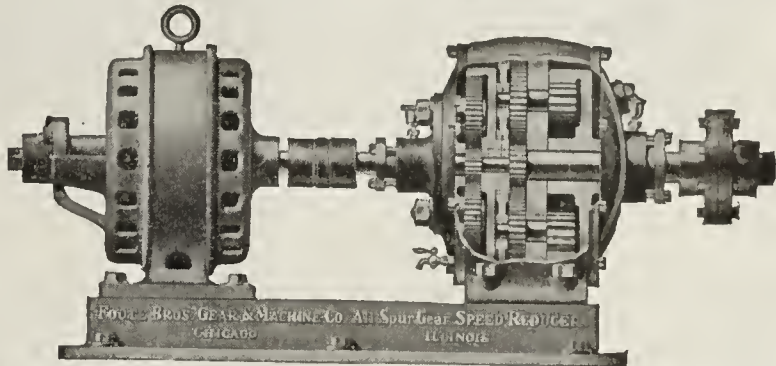
"DURO" METAL Tops—Doors—Frames and

Forms for Erecting
Concrete Silos and Tanks
PURE IRON GALVANIZED



will last as long as the silo.
Write for prices. Manufactured
only by

C. C. Fouts Co., 220 Canal St.
Middletown, Ohio



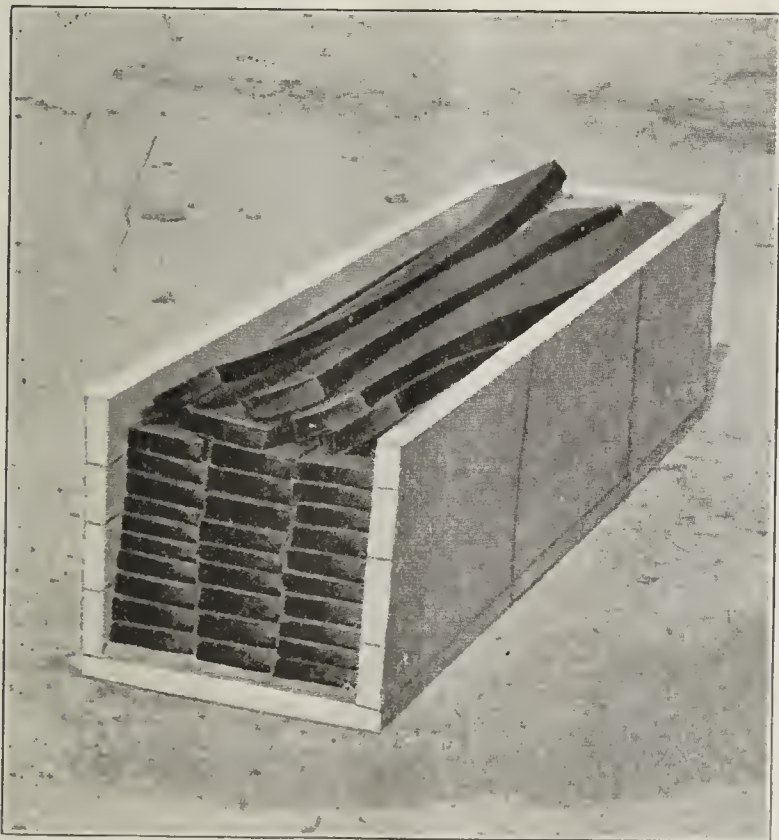
SPUR GEAR SPEED REDUCERS

Note they are dust proof, compact, made in any horse power or reduction. Just what is needed on conveyors, elevators and reduction of speed anywhere. **We manufacture cut gears.** Send for catalogue.

Foote Bros. Gear & M. Co.

210 to 220 N. Carpenter St., Chicago

Genasco Expansion Joints



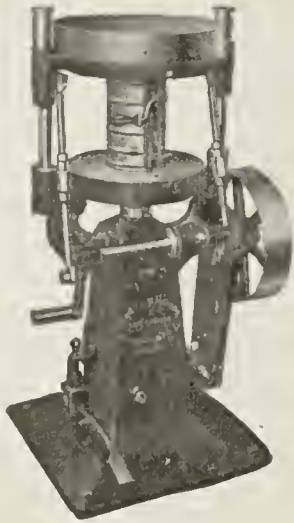
have all the advantages of other prepared joints for concrete, wood-block, brick and granite-block pavements—**economy, ease of installation, the avoiding of melting and pouring**—and besides this

Are All Asphalt

The **entire thickness** of a Genasco joint serves the purposes of expansion and contraction. Ready-made joints that contain felt or some other form of re-enforcement cannot do the work of the Genasco all-asphalt joint. Any thickness or depth.

The best way to judge this joint is to see it. A life-sized sample will be sent to any one interested. Write for it today.

THE BARBER ASPHALT PAVING COMPANY
Philadelphia, Penna.



The Reason Why You Are Not Making Cement Drain Tile Is Because You Have Not Yet Investigated Its Possibilities

The superiority of cement tile for drainage purposes is **known**; there is no competition in quality or price. For this reason its future use is assured, as well as its present use.

The cement drain tile business does **not** require a large investment—nor skilled labor—nor hard selling. A few hundred dollars will start you right; you can use unskilled labor; you can sell all the tile you manufacture without any difficulty.

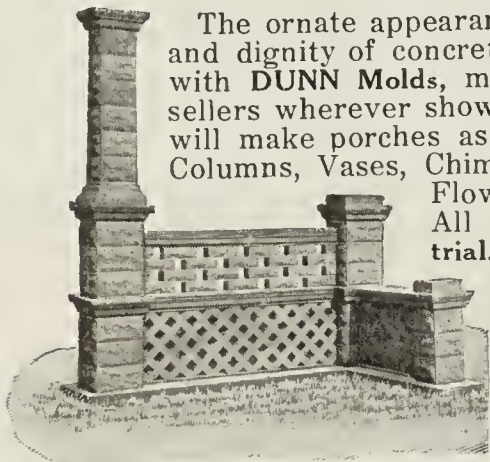
And we are prepared to guarantee profits ranging from **\$230 to \$800** a month.

Ask us today for printed proof of comparative costs and profits in making tile; we send this information free upon request.

Dunn equipment is sold on **15 days' trial**; write for the tile equipment catalog. Price of Dunn No. 1 Tile Machine.....

\$165

Concrete Porches Pay a Bigger Profit Than You Think.



The ornate appearance, permanence and dignity of concrete porches made with **DUNN Molds**, make them ready sellers wherever shown. Dunn Molds will make porches as illustrated, also Columns, Vases, Chimneys, Balusters; Flower Boxes, etc. All sold on **15 days' trial**.

Write for Porch Mold catalog today. Price of outfit for making porch as shown.

\$39

Don't Tamp Sewer Pipe—POUR IT!



Tamping a semi-dry mixture, to make large drain tile and sewer pipe, is not only slow, troublesome and costly—but **unnecessary**. Pouring a wet mixture into **DUNN Molds**, besides being the most efficient method, assures the strongest product. Reduces manufacturing costs, too, and increases the profits.

Dunn Molds permit the manufacture of all size pipe, from 6 to 36 inches in diameter. All sold on **15 days' trial**: Pipe Mold catalog gives full descriptions and prices, ask for a copy. Price of 12-inch mold.....

\$7.50



Pat's No. 842262 and 782700

Here's Mixer Value Out of the Ordinary

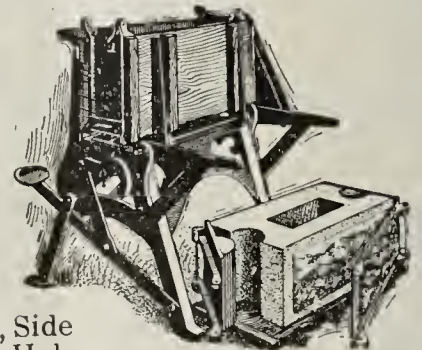
Let facts—not claims—influence your buying judgment. You buy concrete mixers because of what they **are**, not because of what they are claimed to be. To learn about the Dunn construction is to learn the reasons why a **DUNN Mixer** is the mixer you have waited for.

Dunn Mixers have four mixing blades and extra long drums, giving them the highest possible mixing efficiency. The convenient loading height and the **power discharge** feature, save labor. Their capacity—a batch a minute—is assurance of ample speed. The one-piece hollow yoke makes the operation almost noiseless. The all steel and iron construction is evidence of long life.

Write today for catalog describing all styles and sizes. We sell on **15 days' trial**. Prices.....

\$67.50 to \$224

Use Three Block Machines—but Buy only ONE



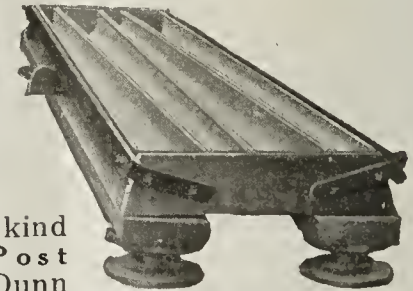
To make Face Down, Side Face and Two-Piece Hollow Wall Cement Blocks **usually** requires three machines. But **one DUNN Combination Cement Block Machine** will make all three types. Saves two-thirds the usual investment.

By using a wet mixture it saves considerable tamping, and makes a stronger block. And a special off-bearing system protects each block against breakage. Capacity, 150 blocks daily.

Sold on **15 days' trial**. Write for Block Machine catalog. Price.....

\$40

The Concrete Fence Posts that Sell the Quickest



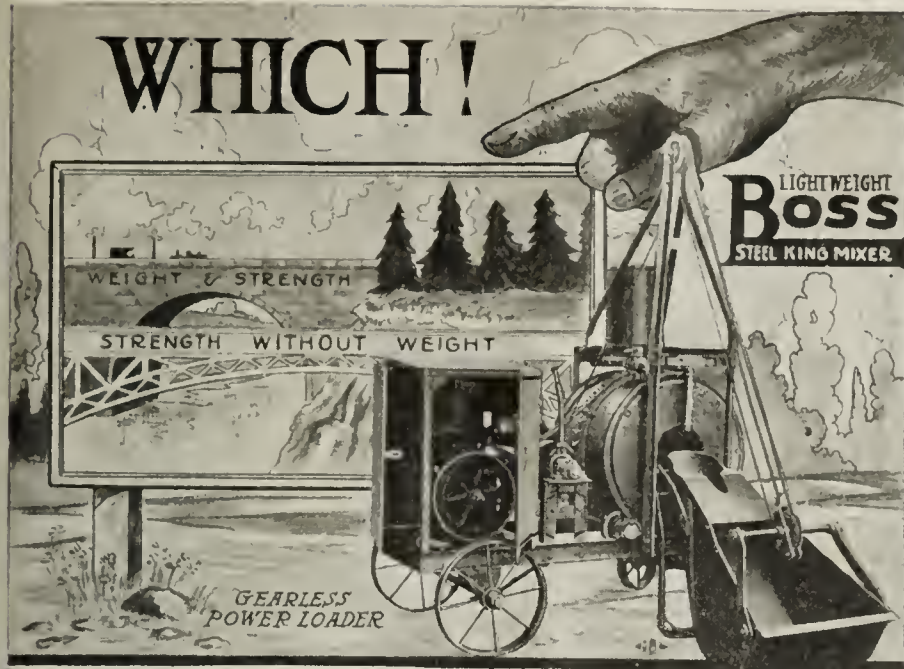
Are those of high quality and moderate price. These are the kind that **DUNN Fence Post Molds** made. The Dunn system enables quick and economical manufacturing. Tamping is eliminated by our special **Vibratory Base** which compacts each post to uniform density and firmness. Made in batteries of four and ten. Sold on **15 days' trial**. Price of 4-mold battery.....

\$12.50



W. E. Dunn Mfg. Co.
4139 Fillmore St., Chicago





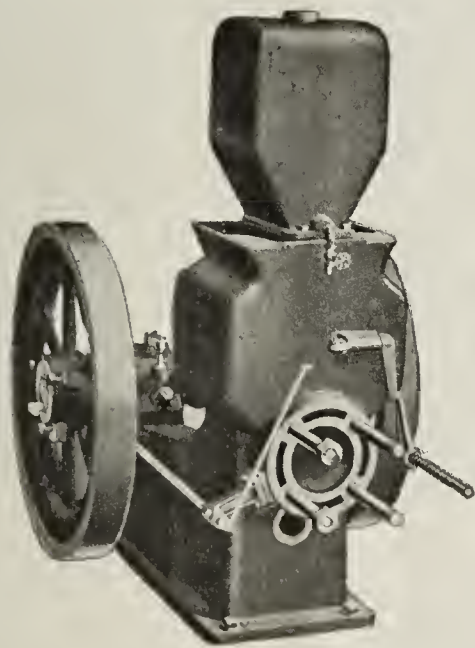
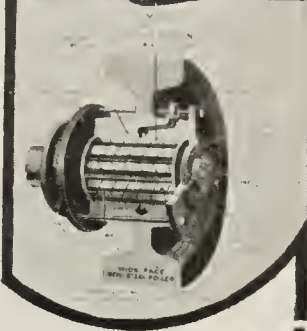
Lightness Means Economy

Half ton Lighter, yet 30% Stronger

Hyatt Roller Bearings (oil once a week) exclusive BOSS improvement—saves 17% power and 70% oil bills. Low 1915 prices make the BOSS the largest selling low priced, high grade mixer in the world. Built in three sizes:—Gas, Steam or Electricity. Backed by strongest guarantee ever written.

Sold on Trial—Cash or Easy Payments. Write for Catalog.

THE AMERICAN CEMENT MACHINE CO. Inc.
9635 Johnson Street Keokuk, Iowa
Stock carried in all principal Cities.



The Engine with the Troubles Left Out

(4 H. P. Type with Cylinder Head Removed)

We are now prepared to offer you our latest type of KEROSENE ENGINES which have the distinctive features of starting directly on kerosene oil.

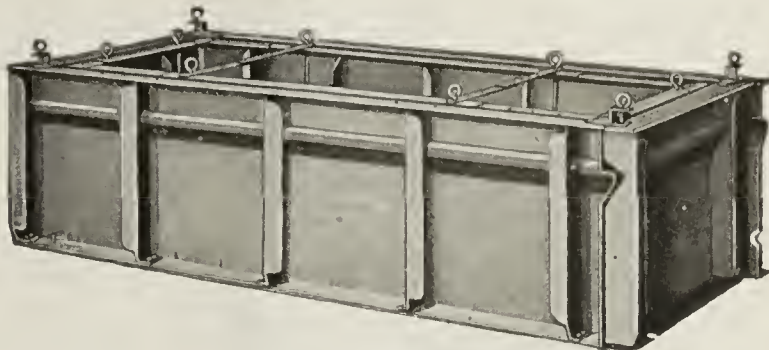
No Batteries No Carburetors No Hot Tubes
No Magnets No Torches No Hot Balls
No Troubles

Users and owners should know about this efficient and fuel-saving engine. Your correspondence is solicited.

The A. M. Castle Engineering Co., Inc.
327 Fay St., - La Crosse, Wis.

The Burial Vault Business

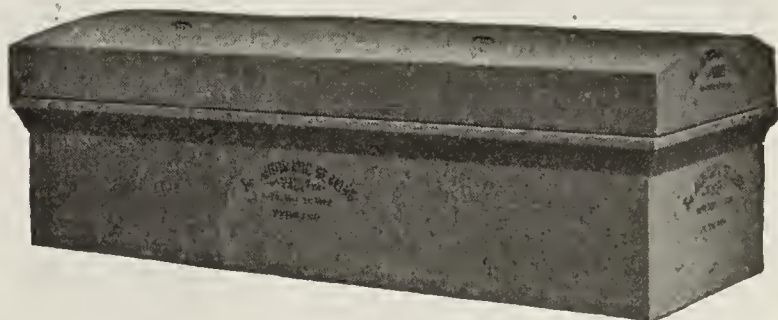
THERE'S no joke about this business. It's sane, solid and sensible. You needn't be ashamed to go into it. You can get business men to back you, because from the very nature of the article a demand for it is increasing right along with the increase in population.



The Adjustable Mold

You can operate this business in connection with a block, brick, tile or post plant, or you can operate it independently. The extent of the vault end of your business depends entirely upon your own enterprise.

Some men first get the idea that you have to peddle vaults at funerals, which naturally stops them from further investigation, but this isn't the right idea at all. You simply work through the undertaker by furnishing him a price that he can sell it for and still enable you both to make a good profit. CONCRETE is the ideal vault material—but ALL concrete vaults without our patented seal are not a success.



The Vault in Seven Sizes from Above Molds

This much is CERTAIN—and a man with very little capital and average common sense and a bit of business energy can start making vaults on a small scale and sell them and make more and sell more until he has a big, well-established money-making business worked up.

BUT—HE MUST START RIGHT—He must be able to make good vaults, at low factory cost—vaults that undertakers would push—vaults that people will demand.

OUR MOLDS are simple, designed so they are adjustable to make 7 standard sizes of vaults, and when the concrete is poured into this mold and has set sufficiently, the molds can be removed, which leaves a smooth surface without the mark of a rivet head showing up.

We sell you the molds outright—no blue sky. You buy the molds at a fair price and they belong to you. But we don't stop there—we help you get started—help you turn out first-class vaults—show you the knacks and methods to get the undertaker lined up.

We'd like to hear from the right kind of men now—the investment required is small, the returns large. OUR BIG BOOK explains all. Fill out the coupon and mail today.

The Automatic Sealing Vault Co.,

203 East River St., Peru, Indiana.

Gentlemen:—Send me your book about your vault molds and the product they turn out, and what the opportunities are.

Name
Address
State

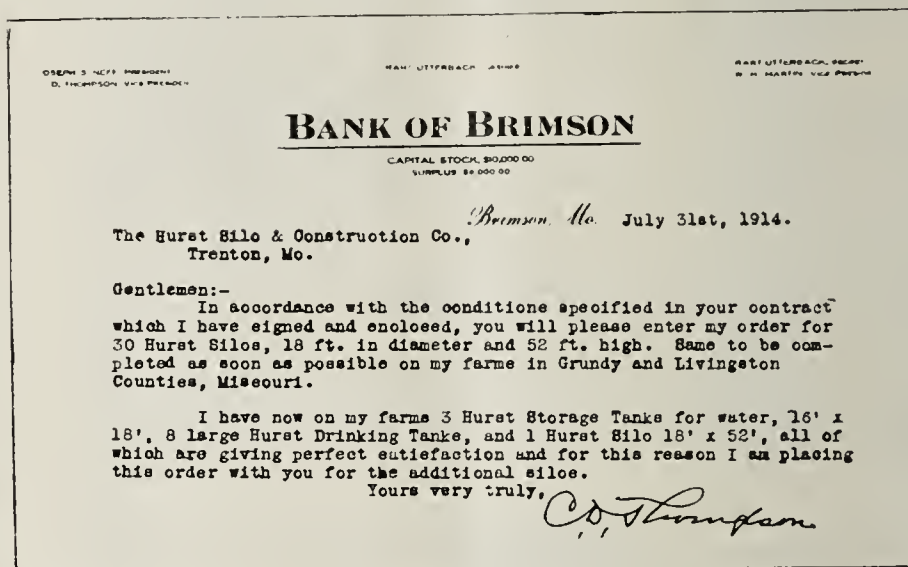
HURST SILO

TEN YEARS AND NOT A FAILURE!

That's the Record



The largest order ever given in the U. S. for Concrete Silos. C. D. Thompson, of Trenton, Mo., places his order for 30 Hurst Silos, 18 feet in diameter and 52 feet high.



Hurst Silos are built of reinforced concrete blocks, made in Hurst Patented Molds using the poured system—a dense block water-proof and of tremendous crushing resistance.

The Hurst System of Silo Construction will interest you. It is inexpensive and enables anyone to turn an investment into quick money. Farmers recognize the Hurst Silos as a sure and safe investment.

What The Hurst Silo & Construction Company, builders of Hurst Silos, write us will interest you. Read it: July 31st, 1914 we purchased the exclusive right to manufacture Hurst Silos and Tanks in 35 counties in Missouri and 5 in Colorado.

August 1st we commenced our factory at Trenton. August 14th we were making blocks. October 22d we had erected 15 silos with 3 more delivered ready for erection, with 4500 blocks curing in the yard.

This, in spite of the fact that we had no salesman employed and did not get started before most silo firms had discontinued business for the winter.

To take care of our business we expect to establish 6 to 10 factories in our territory, each with a capacity of one silo per day.

Our molds, having a capacity of 1 silo per day, cost us less than \$1000.

The Hurst System of reinforced concrete construction reduces to the minimum time, labor, expense and competition.

We have some more openings for live, responsible parties, but they are going fast. Don't put it off, but act now.

Write for Particulars and Catalogue

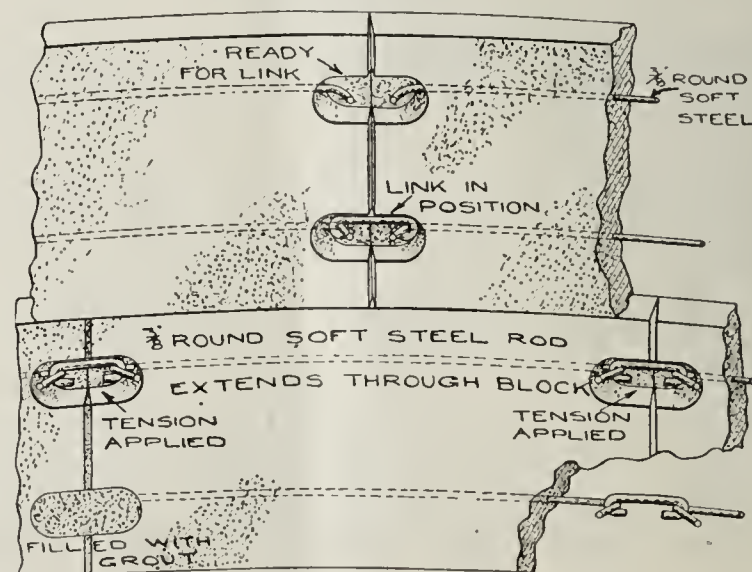
The Chas. B. Hurst Company

Established 1904

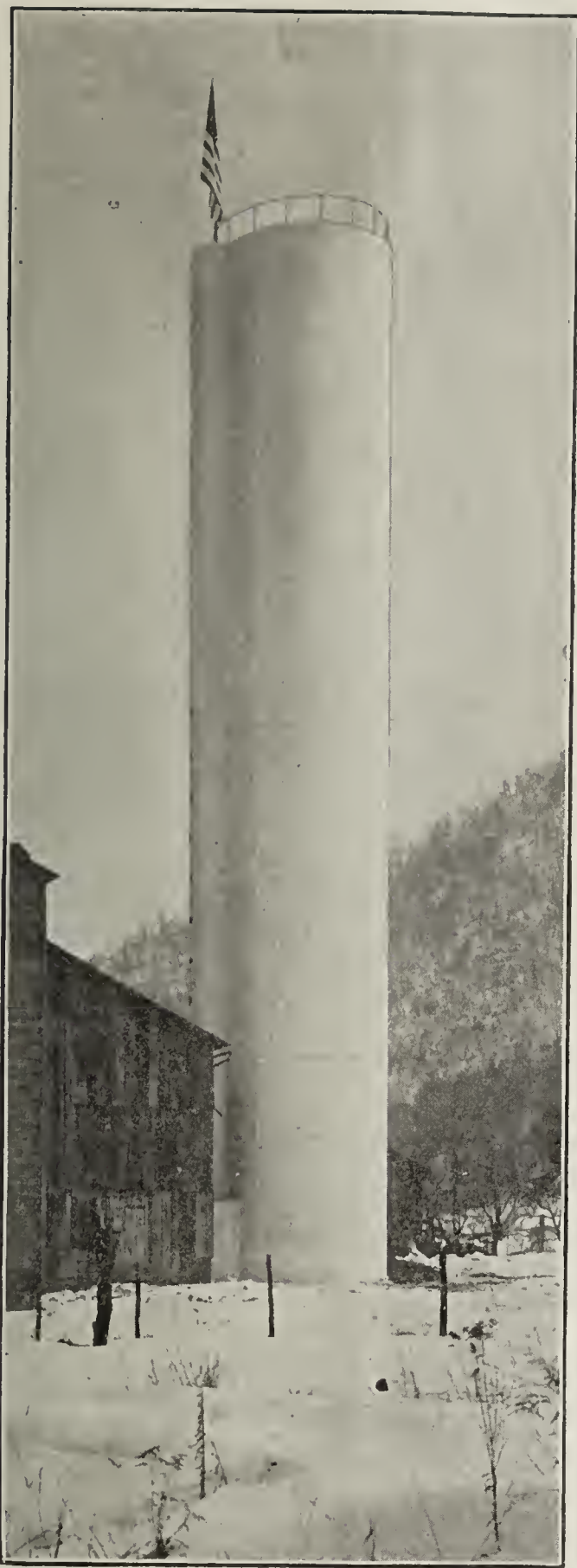
819-829 Exchange Ave.

Union Stock Yards

Chicago



The HURST Reinforced Block for Tank and Silo Construction



A Polk System Silo—16' x 108'
Built by Quality Products Co., Salona, Pa.

YOU

might as well get acquainted with the POLK SYSTEM *now*. There is no sense in waiting until your competitor has a POLK SYSTEM outfit, and has all the farmers in your locality on his contract list. The POLK SYSTEM means *big profits* and *steady business*.

"It Renders the Service"

Polk-Genung-Polk Co.
Fort Branch Indiana

The Perfection Concrete Stave Silo

made by the "wet mix" system.

The staves are so formed that any diameter of silo can be built. The staves are made by the "wet mix" system by casting them in our steel moulds. The product is a strong, non-porous, water proof stave, made with common labor and right at the "silo job." No factory required; you save railroad freight, loading and breakage of staves.

Our "All-Steel Door-System"

is ideal and just what the silo feeder demands. Doors continuous from bottom to top of silo; size 24x25 inches in the clear.

Concrete Workers

get into the Concrete Stave Silo business. It is a growing and permanent business, and our system makes you big Profits.

Get the best form of construction—one that can not be out classed later.

Get the "Perfection."

Write us to-day for our liberal proposition to supply you with our steel moulds and exclusive territory. Let us give you facts and figures on ease of erection, permanency of construction and low cost and big

Profits

to you. You will be highly interested. Write to-day.

Perfection Concrete Stave Silo Co.

506 Clapp Building

DES MOINES, IOWA

MONEY FIRST

It would be preposterous to make a statement of this kind if we were unable to support it. Money appeals to the business man; it's attractive, it's what we



are all working for, and if our proposition is a worthy one there can be no higher calling than the making of money legitimately. Some men work for a dollar a day, others for twenty-five dollars a day—the difference being just twenty-four dollars. The power and influence of the twenty-five-dollar man is greatly enhanced, and he ought to be just that much better fitted for doing his part of the world's work. All of this presupposes that what we have to offer in quality or merit backs up the statement. If we have worked out a system and are able to provide the equipment that will convince the Cement Contractor that he can make \$50.00 a day by the use of the **Conklin Monolithic Silo Molds** where heretofore he has been able to make but \$10.00, it shows plainly that we can make five blades of grass

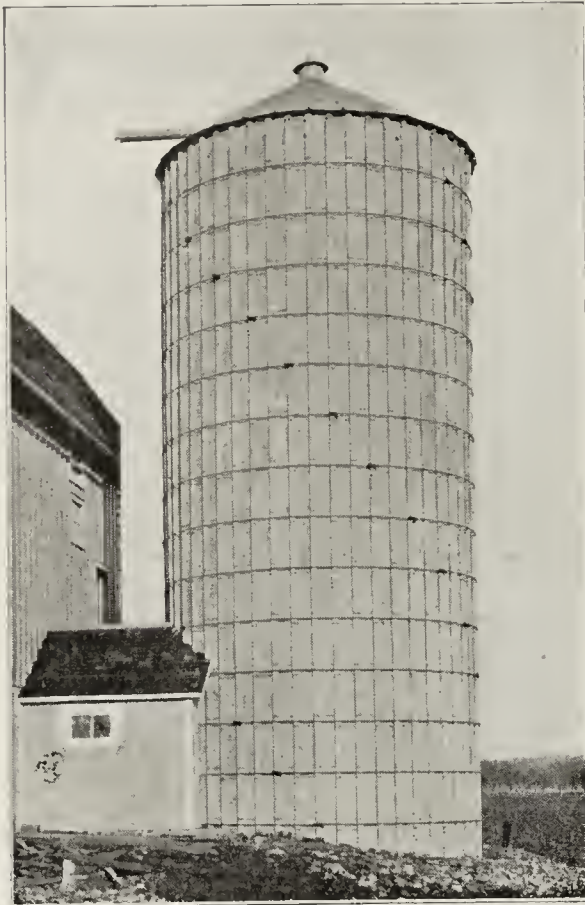
grow where but one grew before. We can increase his efficiency five times.

To any one interested, we will prove to their satisfaction that we can do that and more. We start you in a paying business with a small investment. May we prove it to *you*? Write for Catalogue.

CONKLIN CONSTRUCTION COMPANY
430 Main Street, Hartford, Michigan

A New Principle Invented in Cement Stave Silo Construction A Needed Improvement. Silos, Tanks, Etc., Built Any Size Desired

Mr. S. T. Playford, the originator of cement stave silos, has purchased an absolutely new type of silo. Those who have seen it—and who have made searching comparison with Mr. Playford's earlier efforts in cement stave silos, are united in saying that this invention creates a new standard by which silos must now be judged. This new silo will be known as the S-T-P. The S-T-P Silo embodies the latest, up-to-date knowledge and experience in silo building. Being a new silo, we are not forced to cling to old ideas, patterns and machinery. We have in the most original manner produced a silo that is strikingly different—a silo of incomparable strength and matchless durability and efficiency. The S-T-P will enable you as a contractor to offer an A-No. 1 business proposition to the farmer. The



S-T-P Silo

“SILO THAT'S PERFECT”—Invented by W. A. Hillman

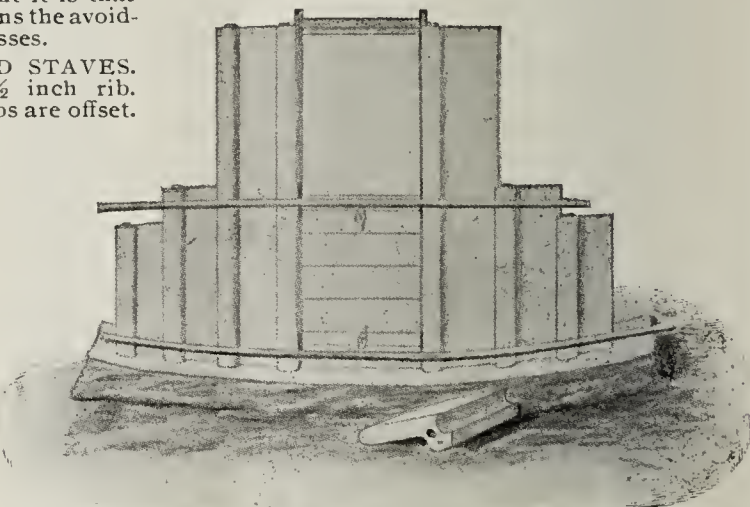
The more you know about silos, the more you will appreciate the S-T-P. The less you know about silos the more important it is that you learn about the “S-T-P.” It means the avoidance of dissatisfaction and money losses.

The “S-T-P” is made of SLUSHED STAVES. Thoroughly reinforced. Has a $4\frac{1}{2}$ inch rib. Pointed up on the outside. The hoops are offset. This to give a ladder to work upon.

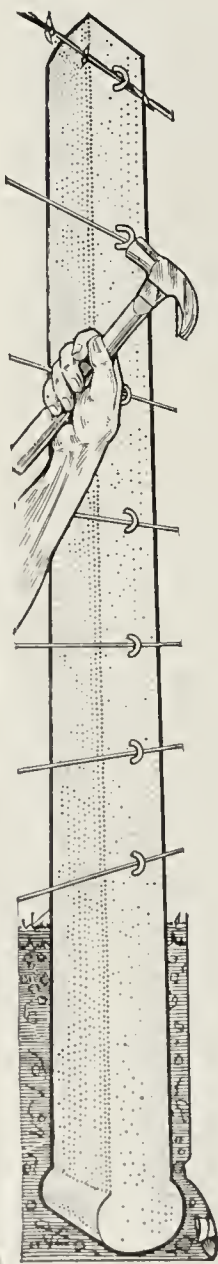
Write for circular,
prices and further
information

**PLAYFORD
MFG. CO.**

298 Douglas Avenue
ELGIN, ILLINOIS



Minnesota Cement Construction Co., Long Prairie, Minn. Andrew Nordloef, Mgr. for Minnesota, No. and So. Dakota, Iowa Nebraska and Wisconsin



You Can Drive Staples Into this Cement Post

If you are going into the post business, why not commence on a *business-like basis*? Equip your plant with our molds, make your posts *wet*—make this a *real business*, not a side line. No *experts* necessary nor a large force of men required to run a *1,000 mold plant*, for *one man can make 200 posts in 10 hours* with material prepared.

Here's a real live wire. The best in the cement field today, as proved by Staple Post plants all over the country.

Yes, this is the STAPLE CONCRETE POST!

You Fasten the Fence Like It Were a **WOODEN** Post!

Furthermore, our staple-receiving composition is as durable as concrete—no wood. Does not add $\frac{1}{10}$ cent to cost of post. **Holds** staples, regardless of age.

This in Itself is Enough

to justify the reputation the Staple Post has earned of being the only *real* substitute for wood.

But Besides

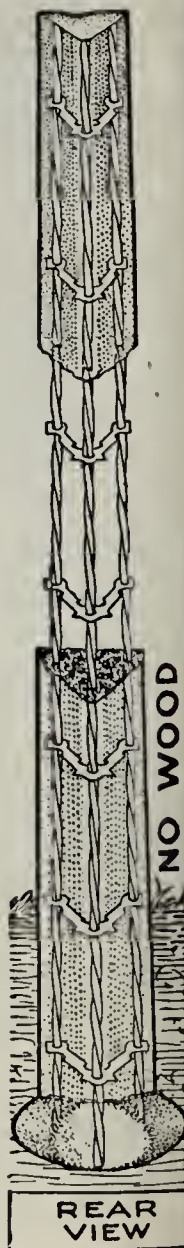
The *reinforcement* is the strongest known—the rods are firmly held *near the corners*.

The weight, 50 lbs., makes the Staple Post the lightest, effecting a very great saving in material, handling and freight.

Our system has been so carefully worked out that the initial cost to manufacture—the only cost—is surprisingly low.

Write Us—We Want to Tell You About a REAL BUSINESS

**STAPLE POST MOLD CO. - 453 W. HOME STREET
WESTERVILLE - OHIO**





MEDUSA WHITE PORTLAND CEMENT

THE FIRST TRUE WHITE PORTLAND EVER MANUFACTURED

MEDUSA is unexcelled for building ornamentation, stucco, concrete building blocks, interior decoration, statuary, cemetery work, parks and grounds, tile, mosaic, setting marble, limestone or brick, etc. It can be used for exterior as well as interior work, and with it results rivaling that of the best white marble can be obtained.

The U. S. Government has used Medusa White in many Post Offices and other buildings, which should be conclusive evidence of its high quality. It is guaranteed to be a high-testing Portland passing standard specifications. Give Medusa a trial and be convinced of its superior quality.

Don't fail to write for our new booklet of illustrations and testimonials

SANDUSKY PORTLAND CEMENT CO.
SANDUSKY, OHIO

PORTLAND CEMENT

**SAMUEL H. FRENCH
& COMPANY**
PHILADELPHIA, PA.

Unvarying Quality and Color —

¶ In the seventeen years CHICAGO-AA Portland Cement has been on the market, there has never been a justifiable complaint.

¶ To keep the quality up to the highest possible standard, and the color bright, attractive, *always the same*, has been our day and night ambition. Our success is indicated by the great and ever-increasing demand for CHICAGO-AA.

Made in one mill and from one quarry by

Chicago Portland Cement Co.
Main Office: 30 No. La Salle Street, Chicago
Mill and Quarry—Oglesby, Ill.



One Man With The Double Action Cement Tools Can Do the Work of Five

in a given time with old style finishing tools—
which means a **SAVING** of EIGHTY PER CENT
OF THE FINISHING COST OF YOUR WORK.

All Our Finishing Tools Work Automatically

Finishing Trowel has 24-inch blade; 16-inch
trowel with jointer attachment, edger and float.

BETTER WORK AT LESS COST

Send For Catalog and Prices

ABRAM CEMENT TOOL MFG. CO.
DUGGER, IND.

SLAG from blast furnaces for Concrete

Blast-furnace slag used as an aggregate in concrete represents economy, safety and strength

For many reasons, blast-furnace slag is an ideal concrete material—its alkaline nature, tending to prevent rust in reinforced concrete—its light weight, enabling it, in floor slabs for instance, to support a given live load with smaller dead load on supporting frame—its contents of silica, alumina and iron, which increases the permanency of any concrete of which it is a part—its fire-resisting qualities—these are some of the features which have impelled the most careful engineers and architects to specify slag in place of other concrete aggregates. The high crushing strength of slag-concrete has been demonstrated in various tests made of unprejudiced parties in nearly every large city. Slag-concrete has always developed strength uniformly higher than gravel-concrete or limestone-concrete.

Engineers and Architects

Blast-furnace slag as a concrete material is better understood than it used to be. Before you write your concrete specifications, get in touch with any of the following competing producers of blast-furnace slag—let them submit the results of long-time tests of slag-concrete.

Birmingham Slag Co.
1001 Woodward Building
Birmingham, Ala.

The Sommerfield Co., Inc.
1863 61st Street
Brooklyn, N. Y.

The France Co.
Second National Bank Bldg.
Toledo, Ohio

LITTLE GIANT MIXER

Our Model A, shown herewith, is the most practical Hand Power Mixer on the market. Its blend is perfect and will stand the closest inspection. Its capacity depends upon the power at the crank. A man can turn out from 3 to 5 yards per hour. An engine will double this capacity. We can furnish engines also.

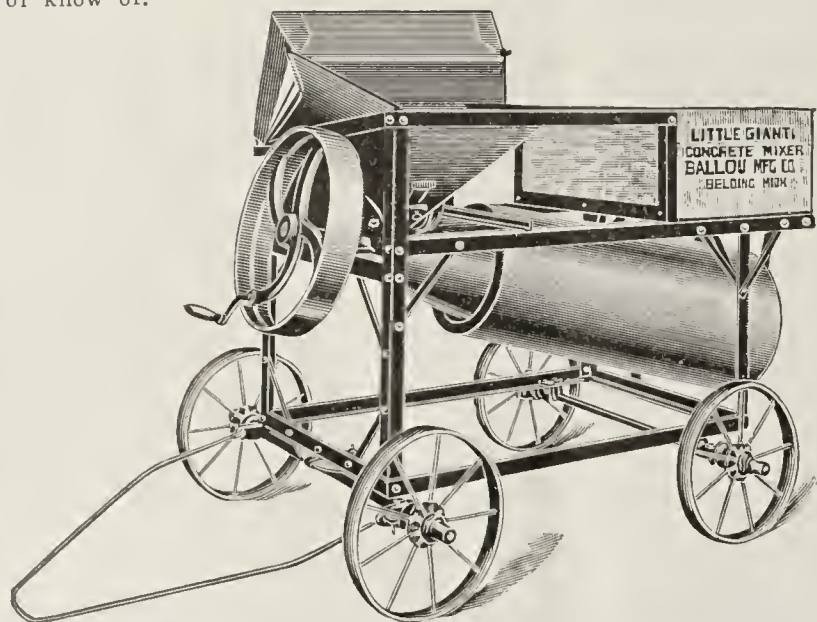
"I have used the Little Giant Hand Power Mixer for two seasons," writes I. J. H. Fender, Coral, Mich. "I have been well satisfied with the ease of operation and the quality and product of the concrete produced."

"With this mixer I put in 260 yards of concrete in two and one-half days on a road bridge in Howard City, Mich."

"I have been using the Little Giant Mixer continuously for all classes of foundation work, and in my block factory for making blocks, bricks and vaults."

"Previous to buying this Little Giant Mixer I bought a batch mixer but discarded it in a short time as it was too slow and practically worthless as a money maker."

"This Little Giant Mixer is a marvel in simplicity, for quality of concrete produced, and the smallness of expense for upkeep, and I would not change it for any other mixer that I have seen or know of."



BALLOU MFG. CO., 99 High Street, BELDING, Mich.

Compactness and Sturdiness Mean Greater Efficiency



The "Excelsior"

was designed and built to set a fast pace for the higher priced mixers and contractors say it does.

Equipped with low hopper; friction clutch; dust proof bearings; 3 H. P. engine. Can be equipped with hoist at small additional cost. Capacity 4½ feet mixed material per batch; easily 65 cu. yds. per day.

Write for illustrated catalog and judge for yourself the extra value of the EXCELSIOR.

Good territory open for agents

Excelsior Mixer & Machinery Co.
606 Merrill Bldg. Milwaukee, Wis.

AGENTS: Universal Steel Products Co., Chicago, Ill. L. & D. P. Smith, Valdosta, Ga. Loyal Power Co., Omaha, Neb. Manufacturers Supply Co., Minneapolis, Minn. Ward Equipment Co., Pittsburgh, Pa. E. W. Ripley, Farmington, Me.



The Commonwealth Power Co. tunnel under Grand Ave., Milwaukee, Wis., recently successfully waterproofed with

"Hydrite"

COLORLESS WATERPROOFING

Hourly Leakage 5200 Gallons STOPPED! 700 ft. Concrete Tunnel 55 feet below datum was made watertight.

The success of our method eliminated the necessity of pumps and SAVED \$80.00 to \$100.00 PER MONTH.

In addition to the possibility of damage to the cables, etc., from the seepage. This tunnel, 10 years old, has been free from leakage for nine months, or since work was completed. We guarantee it to stay so.

HAVE YOU A WATERPROOFING PROBLEM?

Difficult waterproofing problems in NEW or OLD work can be economically and successfully solved. The experience of a successful organization is at your service and satisfactory results are guaranteed.

Our method of applying grout, internally or externally, under heavy pressure through pipes, or upon the surface, as the conditions require, is applicable to tunnels, reservoirs, foundations, basements, etc., of masonry or concrete construction. Leaks are not only stopped but the structures are strengthened.

Let us help you with your waterproofing problem. Write us concerning our product and methods. Ask for descriptive booklet.

WATERPROOFING COMPANY OF AMERICA MILWAUKEE, WIS.

Branch Offices:
543 McCormick Building, Chicago. Callahan Bank Building, Dayton, Ohio.
1014 Transportation Building, Montreal, Canada.



SIDEWALK FORMS CURB AND GUTTER FORMS

The contractor who bids on sidewalks, curbs, curb and gutters with the idea of using wooden forms is generally bidding under a definite handicap and will always do the work with less profit than he could with steel forms.

HELTZEL steel forms are the oldest on the market. They are built by the largest builders of concrete forms in the world. Spread over the work of a season or two they mean a lower form cost per running foot of sidewalk than the use of wood forms. They are easily assembled. Work is fine, accurate and even. Write today for Free Catalog.

Heltzel Steel Form & Iron Works Niles Road, Warren, Ohio

Test and Try Before You Buy

It Is Your Privilege to Test the U. S. STANDARD CONCRETE MIXER Before You Buy

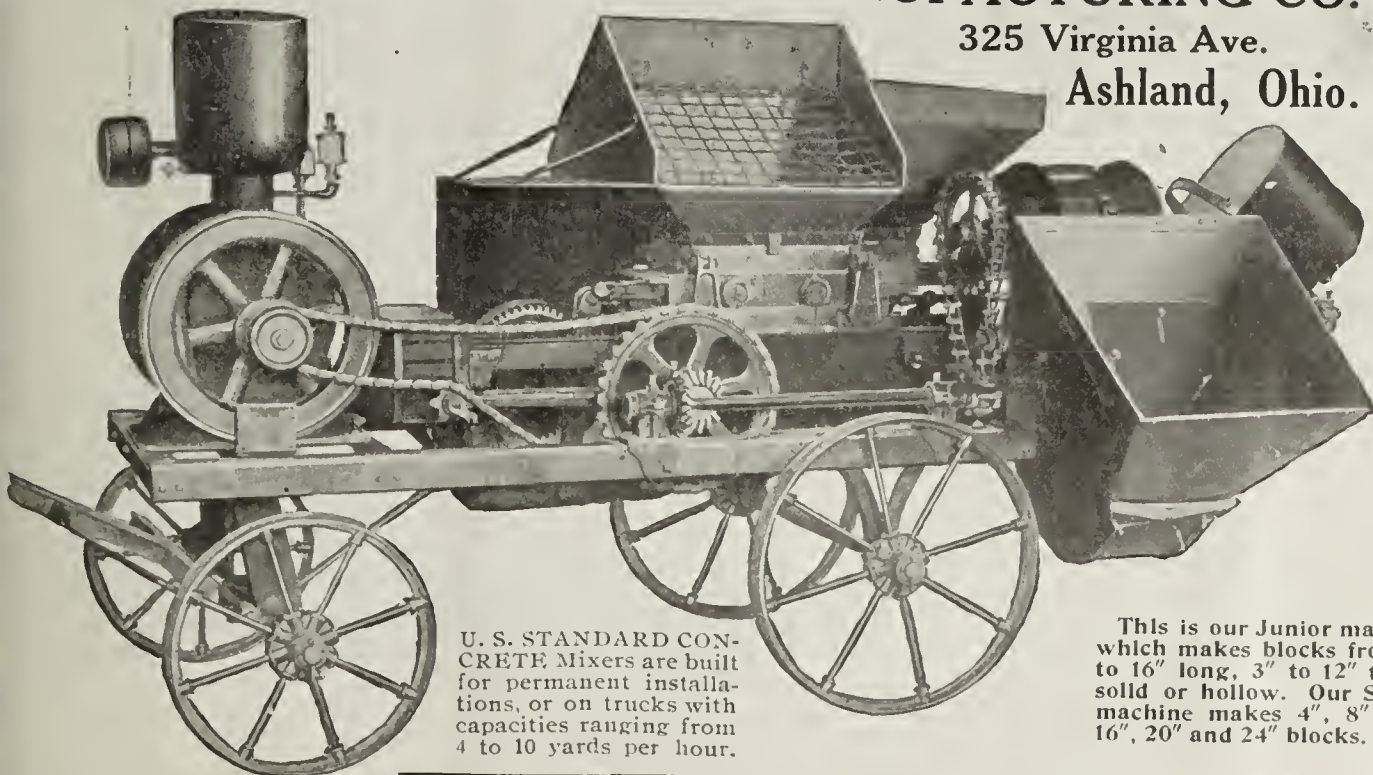
The U. S. STANDARD CONCRETE MIXER is a continuous mixer with a positive measuring, proportioning and feeding device which makes it more accurate than any batch mixer ever made, because it does not depend upon the brain of the operator. It will stand the hardest tests put to it. There are no weak parts in it to cause break-downs, or defective operating parts to cause delay. All parts are interchangeable; workmanship the best. Warranted to embody the most practical and up-to-date working principles. Simple operations change the adjustments to suit any worker. Is giving excellent satisfaction to users. All we ask is a chance to have you try our mixer. We will operate the mixer to your satisfaction on the job, or no sale.

WRITE FOR CATALOG
"A"

U.S. STANDARD MANUFACTURING CO.

325 Virginia Ave.

Ashland, Ohio.



U. S. STANDARD CON-
CRETE Mixers are built
for permanent installa-
tions, or on trucks with
capacities ranging from
4 to 10 yards per hour.

We also manufacture the famous U. S. STANDARD Block Machine. Turns out solid or veneer blocks, as well as hollow blocks with oval air spaces. It is built in two sizes, and is so designed that it handles wet mixture perfectly, resulting in a block of unusual density and strength. For speed they cannot be surpassed.



This is our Junior machine which makes blocks from 4" to 16" long, 3" to 12" thick, solid or hollow. Our Senior machine makes 4", 8", 12", 16", 20" and 24" blocks.

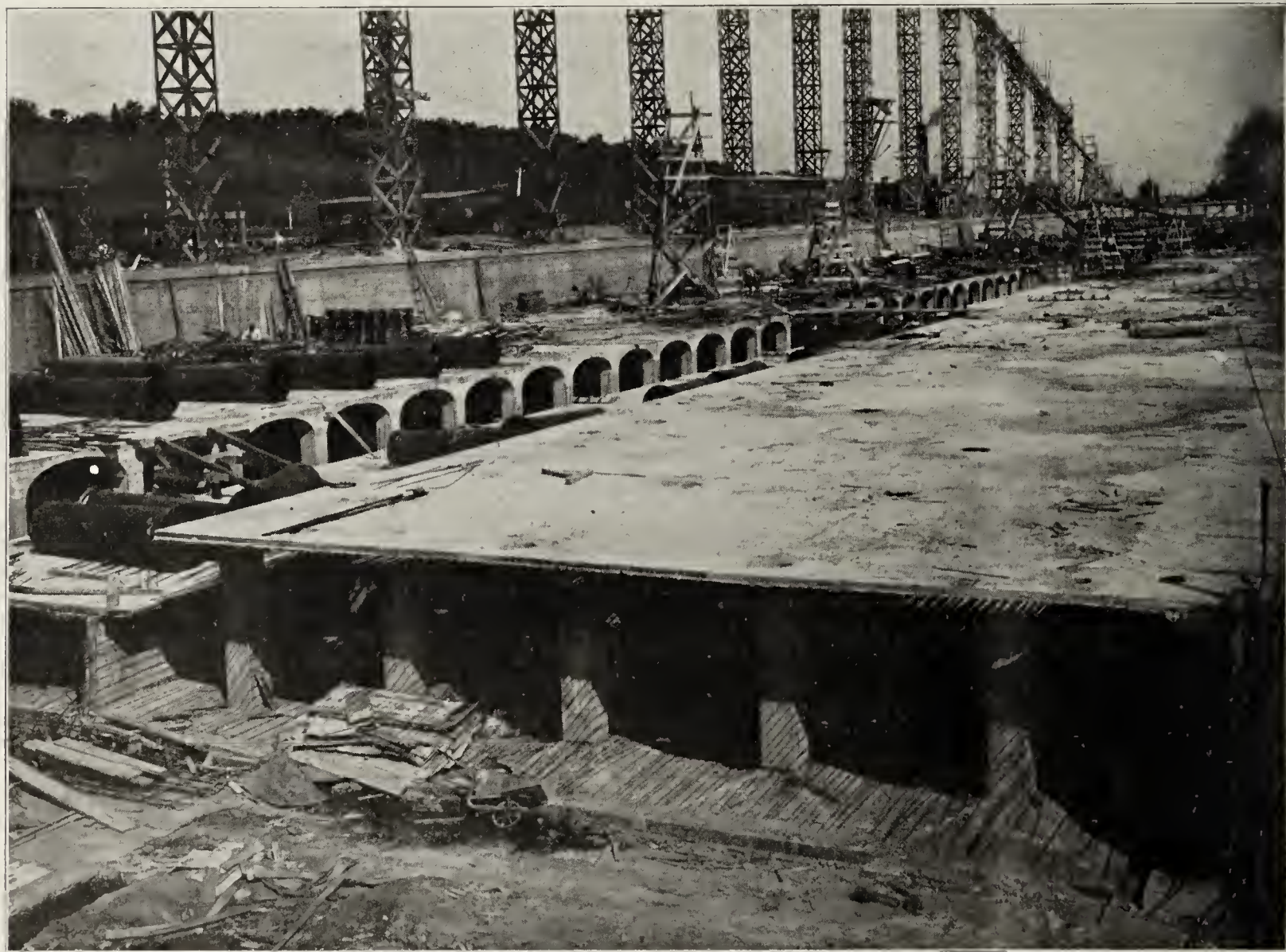
HYDRATED LIME

added to concrete makes it denser, stronger and watertight

DR. E. W. Lazell, the well known lime expert, says: "The denser the mortar or concrete, the greater the strength, other factors being equal. This fact is, I think, generally admitted. If, then, hydrated lime increases the density, the strength of the mortar or concrete must be increased. The question therefore resolves itself into proving whether or not hydrated lime increases the density.

"It is well known that mortars composed of Portland cement and sand are harsh working and non-plastic, that is, they are not easily molded or troweled. These harsh mortars require considerable manual work to mold or to form into any given shape. The addition of hydrated lime overcomes this harshness, rendering the mortar more plastic. It must therefore follow that the same amount of manual labor in molding or troweling will produce a denser mass.

"In the writer's opinion, the greatest advantage of the use of hydrated lime is this quality of rendering the mortars more plastic, the increased plasticity resulting in greater density. Exactly the same argument applies to concrete. Concrete containing a small amount of hydrated lime is much more plastic and smoother working than similar concrete containing no hydrate. Because of this greater plasticity the same amount of tamping would result in a denser concrete. The part played by the hydrate is wholly mechanical, imparting greater density to the concrete. It is further a well known fact that lime paste tends to retain its mechanically mixed water, thus hydrated lime retards the drying out of both mortar and concrete and supplies the water necessary for the full development of the strength of the cement. This quality of hydrated lime is particularly valuable when used in cement mortar, since the affinity of the hydrate for water keeps the mass damp and allows the cement to gain its full strength."



St. Louis Builds World's Largest Mechanical Filter Plant

Edward E. Wall, Water Commissioner, St. Louis, Mo., says:

"The design provides for forty 4,000,000 gallon daily filter units, each 50 x 28 ft. in plan, supported on concrete columns 20 in. square, spaced 11 ft. on centers north and south and 10 ft. 3 ins. on centers east and west.

"On the original basin floor inverted concrete arches were laid to distribute the foundation loads of the columns. The filter boxes rest on the reinforced concrete floor formed by leveling up the groined arches joining the tops of the columns. Each filter box is poured as a monolith, the concrete mixture being 1:2:4, with 25 lb. of **HYDRATED LIME ADDED FOR EACH BARREL OF CEMENT, FOR THE PURPOSE OF MAKING THE BOXES WATERTIGHT.**"

Below are some notable concrete structures recently built in which Hydrated Lime was used in the concrete work to make the concrete dense and thereby rendering the concrete more water proof:

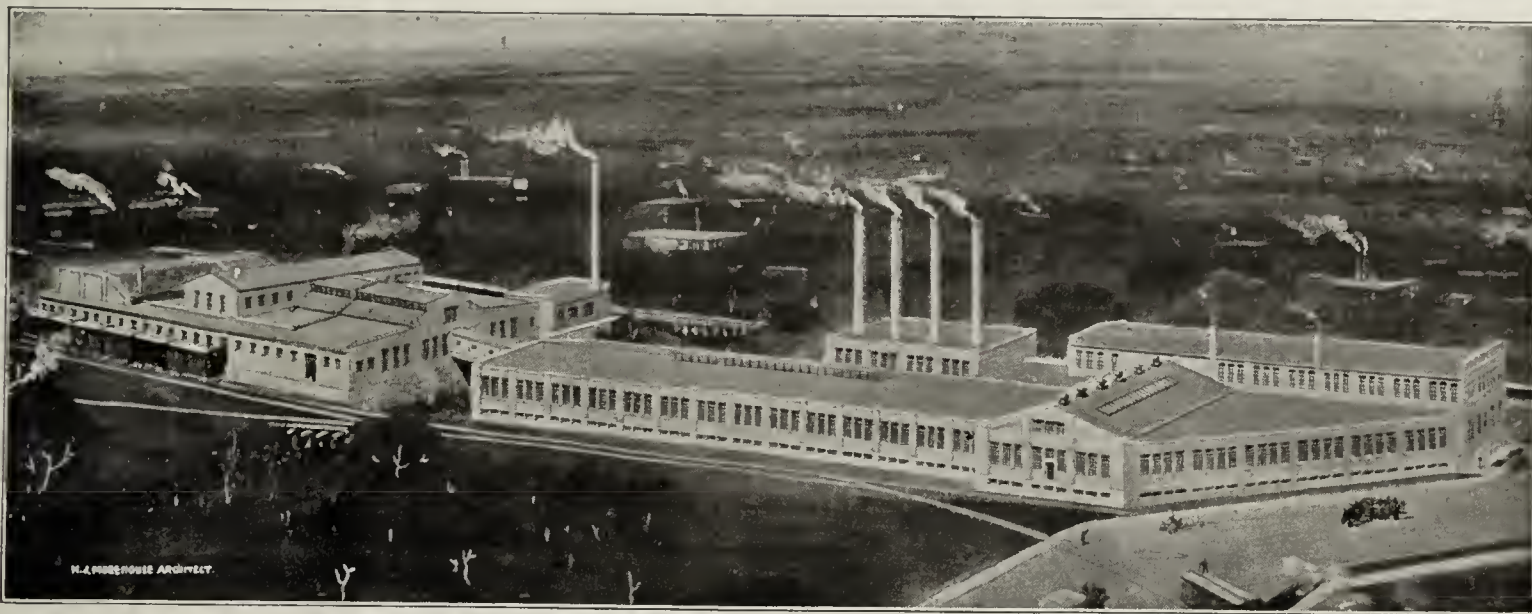
Full detailed information of the methods and cost of using Hydrated Lime may be secured from any of the following manufacturers of Hydrated Lime:

Longview Lime Works,
Birmingham, Ala.
Saginaw Lime & Lumber Co.,
Saginaw, Alabama
Charles Warner Co.,
Wilmington, Del.
Marblehead Lime Co.,
Chicago, Ill.
Ohio & Western Lime Co.,
Huntington, Ind.
Security Cement & Lime Co.,
Hagerstown, Md.
Lee Lime Co.,
Lee, Mass.

Charlevoix Rock Product Co.,
Charlevoix, Mich.
White Marble Lime Co.,
Manistique, Mich.
Glencoe Lime & Cement Co.,
St. Louis, Mo.
Dutchess County Lime Co.,
Dover Plains, N. Y.
Rockland & Rockport Lime Co.,
101 Park Ave., New York, N. Y.
Charles Warner Co.,
103 Park Ave., New York, N. Y.
Union Lime Co.,
Pabst Bldg., Milwaukee, Wis.

Kelly Island Lime & Transport Co.,
Cleveland, Ohio.
National Lime & Stone Co.,
Carey, Ohio.
John D. Owens & Son Co.,
Owens, Ohio.
Woodville Lime & Cement Co.,
Toledo, Ohio.
Charles Warner Co.,
Land Title Bldg., Philadelphia, Pa.
National Mortar & Supply Co.,
Pittsburgh, Pa.
Rapid City Gypsum, Lime & Portland
Cement Co., Rapid City, S. D.

Gager Lime & Mfg. Co.,
Chattanooga, Tenn.
Dittlinger Lime Co.,
New Braunfels, Tex.
Round Rock White Lime Co.,
Round Rock, Tex.
Riverton Lime Co.,
Riverton, Va.
International Lime Co.,
Sumas, Wash.
Standard Lime & Stone Co.,
Fond du Lac, Wis.



To protect a basement of 31,500 sq. ft. of floor space against an eight or nine foot head of water, was the problem that confronted the builders of the plant, shown above, the magnificent home of the Michigan Carton Co., Battle Creek, Mich.

The basement of this plant is 14 feet high, 75 feet wide and 420 feet long. The building stands on very low, marshy ground, on what was formerly, in fact, the bed of the Kalamazoo River. At present, however, the stream has been diverted and flows like a mill race, in times of high water, between the main buildings. At such times the water rises to a depth of 8 or 9 feet above the floor level and the rear wall of the basement must act as a retaining wall against the flood.

"Hydrated Lime" was the happy and effectual solution of this difficult problem and the interesting facts are given by Mr. M. J. Morehouse, the well-known architect of Chicago, who had charge of the work.

The floors and walls are of concrete, both waterproofed, the latter up to a height of 10 feet. The mixture used was one part cement, four and one-half parts of sand and gravel, and seven to eight per cent by weight of cement of "Hydrated Lime."



REINFORCED CONCRETE RESERVOIR, LISBON FALLS, MAINE.
To Make this Reservoir Watertight Hydrated Lime Was Added Equal to 8% of the Cement to the Concrete When It Was Being Mixed.



CLACKAMAS DAM, BUILT BY THE PORTLAND (OREGON) RAILWAY, LIGHT & POWER COMPANY.

90% Portland Cement; 10% Hydrated Lime.

Hydrated Lime is simply commercial lime scientifically slaked in the process of manufacture. It is shipped to you in 40 lb. paper bags or 100 lb. cloth bags, and there is no fire risk connected with its storage.

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Position wanted as cement plant superintendent in West or Middle West. High degree of efficiency a specialty. Address W. B., care Cement & Eng. News, Schiller Bldg., Chicago.

WANT TO BUY the following SECOND-HAND MACHINERY

Locomotive Crane
No. 7½ Gyratory Crusher
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2 Crushers, from 1 to 10 ton Capacity
Orange Peel and Clam
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Cement Chemist of wide experience and with best references will accept position with company offering opportunity for advancement. Address B. F., care Cement & Eng. News, Chicago.

WANTED

One No. 7½ Gyratory Crusher. Give full particulars and price in first letter. Address Box 20, care Cement & Engineering News, Chicago, Ill.

WANTED

Position by experienced cement tester. Eight years practical experience. For particulars and references address H. R., care Cement & Engineering News. State salary paid.

WANTED.

Wanted to hear from owner of good cement plant. Send cash price and particulars. D. F. Bush, Minneapolis, Minn.

Cement Chemist having six years' experience in running Cement Mills, desires position as chief chemist with small company. Address D. E., care Cement & Eng. News, Schiller Bldg., Chicago.

For sale, lease or will take partner, under exceptional terms, an up-to-date Concrete Products plant of excellent repute, near Philadelphia in heart of raw material deposits. Railroad siding, steam heat, and curing plant. Mixers, crushers, screens, surfacing machines for rubbing and tooling, all power driven. Failing health of senior member necessitates change. P. O. Box 864, Haddon Heights, N. J.

NEW BOOKS

Rock Drilling. By R. T. Dana and W. L. Saunders. Pp. 319; ill., index. For sale by the Cement & Engineering News, 1117 Schiller Bldg., Chicago. Price \$4.

Following a general introductory statement covering blasting and explosives, this volume treats in detail the methods and costs of open-cut excavation and submarine rock-drilling. It is based principally on material collected and compiled by engineers of the Construction Service Co., and includes accurate records of cost and drill duty in many kinds of work. Diagrams and tables are freely used in such shape as to make more than a mere record of cost. Accurate comparisons and analyses become easy. The book is well written and well illustrated and is sure to prove of large value to consulting and constructing engineers.

Reinforced Concrete Construction is the title of a 300-page publication by H. Adams and E. R. Matthews just received from the press. The book contains enough, and fortunately not too much, mathematics to make it interesting and valuable to the reader and treats in an exhaustive and practical manner all branches of reinforced concrete construction. More than 300 cuts illustrating modern work done in concrete add life and charm to the ambitious compilation. No contractor or practical superintendent striving for mastery in this art should be without it. Price, \$3.00; forwarded postpaid by Cement and Engineering News upon receipt of price.



LET US SHOW YOU that there is more money in building concrete culverts over our forms, than in any other branch of your business. One form adjusts to any size from 20 inches to 48 inches in diameter, so you need but one investment for all your culvert work. We also make an arch form, adjusting from 6 to 12 feet. One of these forms will insure you all the culvert building in your vicinity at profits that will exceed any other branch of your contracting. Write at once for free catalog and special offer to contractors.

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FROSTPROOFING

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A small amount mixed with the cement or lime keeps from freezing, prevents rusting of forms and reinforcing, and makes stronger concrete. Can be used in the coldest weather with absolute success.

Get the cold weather prices while the warm weather fellow does the loafing. Complete your concrete jobs now instead of allowing them to hang over.

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100 lb. sacks carried at all warehouses.

Get posted on this newest and greatest invention which enables concreting the year around.

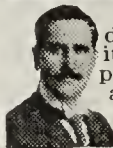
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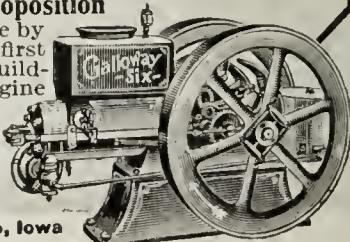
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Hollow Cement Building Blocks WITH GRANITE FACES



8x8x24 inch Granite Smooth Face Block

*They Cost Less
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BY A NEW process, which protects the facing, while the block is being cast, we eliminate all traces of cement from the face of block and nothing but the GENUINE GRANITE SHOWS IN ALL ITS SPARKLING BEAUTY.

These cuts show blocks just as they came from the molds, they are not treated with acid or scrubbed with brush, or sprayed.

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Send us fifty cents and we will send, freight prepaid, to any point in the United States, east of the Mississippi and north of the Ohio Rivers, a granite-faced block, one-half rock-faced and one-half plain-faced. **YOU WILL SAY WHEN YOU GET IT THAT YOU NEVER SAW A CEMENT BLOCK BEFORE.**

They are positively cheaper to make than the ordinary dry-tamp, sand faced block.

MR. BLOCK MAKER: What show will you have if your competitor secures the exclusive right for this system in your city?

ASK US ABOUT OUR MOLDS FOR MAKING SILO BLOCKS.

Send for a Catalog fully describing our system and showing our multiple molds mounted on trucks, for casting hollow cement building blocks.



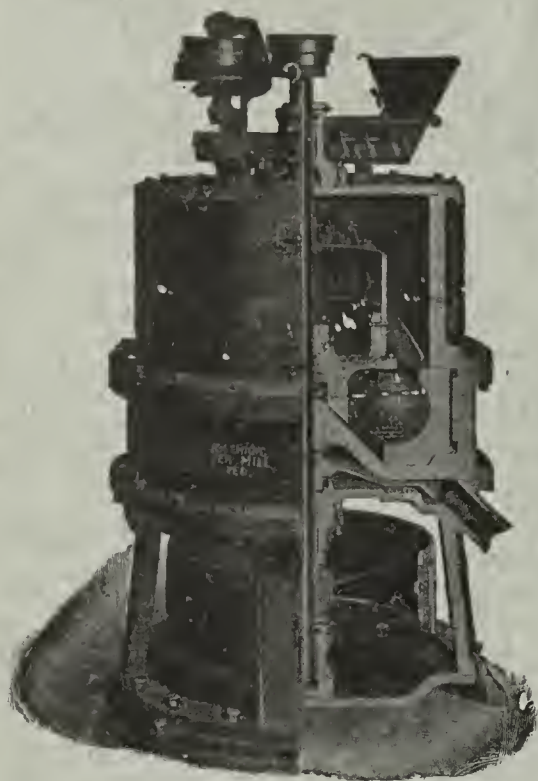
Enlarged View of Granite Smooth Facing

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Cement having a higher percentage of Impalpable Powder than can be obtained by any other mill. Tests show that the tensile strength of a 1-5 mortar made with cement pulverized by the Fuller Mill is higher than the tensile strength of a 1-3 mortar made with cement pulverized to the fineness required by the Standard Specifications.

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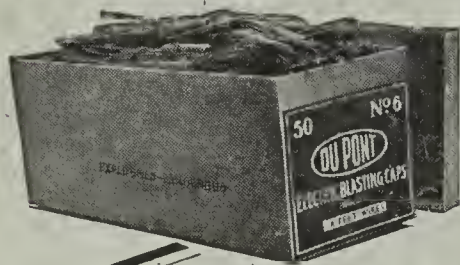
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You may buy some cheaper grades of Shovel Chain than "XX" but our High Grade "XX" Chain is always cheaper in the end. Send for catalogue and prices.

Some manufacturers make several grades of so-called Shovel Chain. We make one grade.

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THEY are made of materials selected by experts having a wide practical knowledge of explosives and their detonation. These

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EXPLOSIVES are dependent on complete detonation for the maximum of execution in tunnel, trench or quarry.

WHY risk the loss of labor, charge and possible misfire by attempting to detonate explosives with weak blasting caps or electric blasting caps?

INSIST THAT YOUR BLASTING CREWS
USE DU PONT NO. 6, 7 OR 8 DETONATORS

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Vol. 27

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No. 5

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Portland-Cement-Making Factories

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Machinery

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In order to give you an opportunity to PROVE our claims, we are willing to send you 25 pounds of Impervite for \$2.00 (freight prepaid by us) with the understanding that if it does not prove more efficient than the com-

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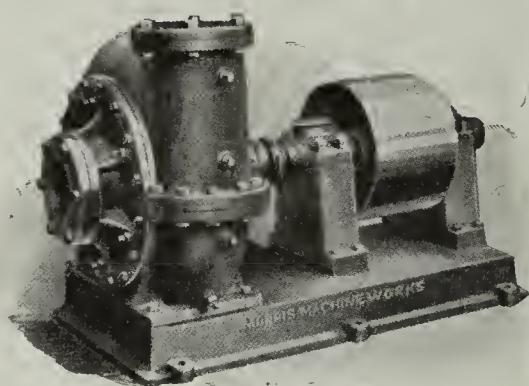
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MORRIS

Solid Lined

Dredging Pumps



EVERYTHING that enters into the construction of the Morris Solid Lined Dredging Pump is of heavy proportions and the general design is such that wear is reduced to the smallest possible extent. Its ability to outlast other dredging pumps is its chief claim to economy.

By removing the upper half of the pump shell, the lining can be taken out or by removing the disc on the pump shell and the inner disc on the lining, the runner can be taken out. The pump is easily and quickly taken apart if necessary to replace lining or piston.

*Write for Sand and
Gravel Pump Catalog*

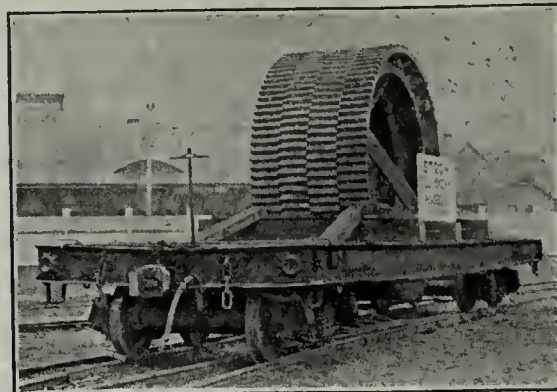
**Morris Machine
Works**

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Stroh Process



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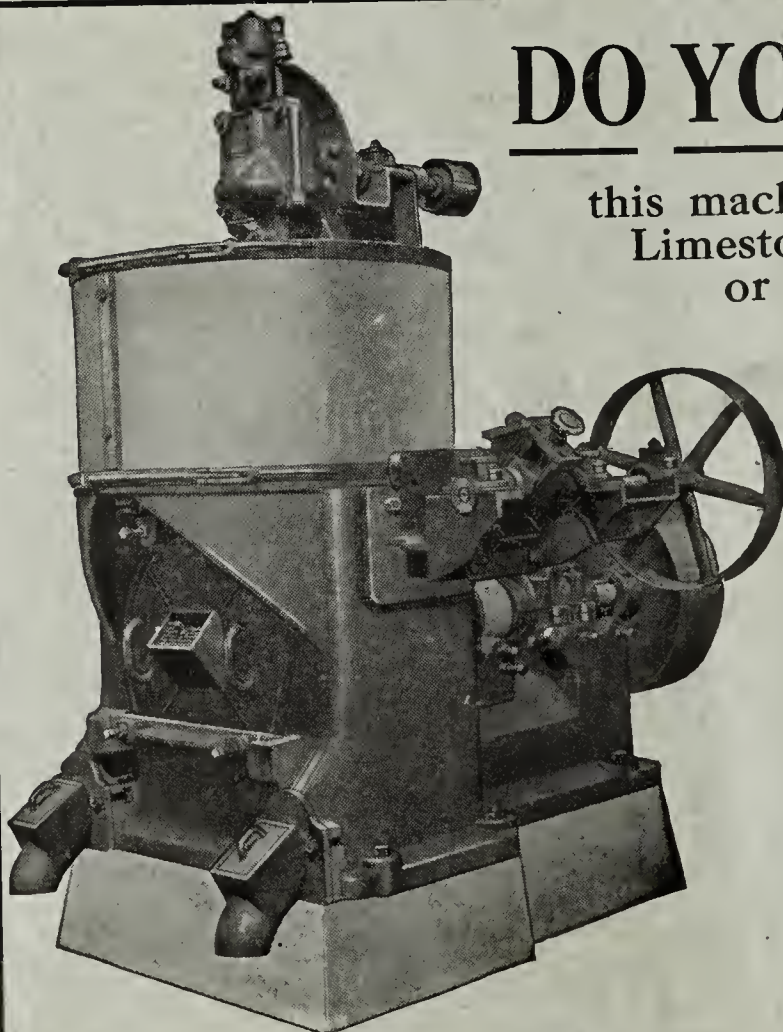
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Kennedy-Stroh Corp.
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DO YOU KNOW

this machine will grind
Limestone, Clinker
or Coal and



FINISH IT
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6-8 Tons Limestone
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PER HOUR

**SIMPLIFIES
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"The Quality Mixer at the Right Price"



The Bottom Knocked
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Buy the
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Your Own Price

When quality and price meet you get an investment worth while
See Catalog showing

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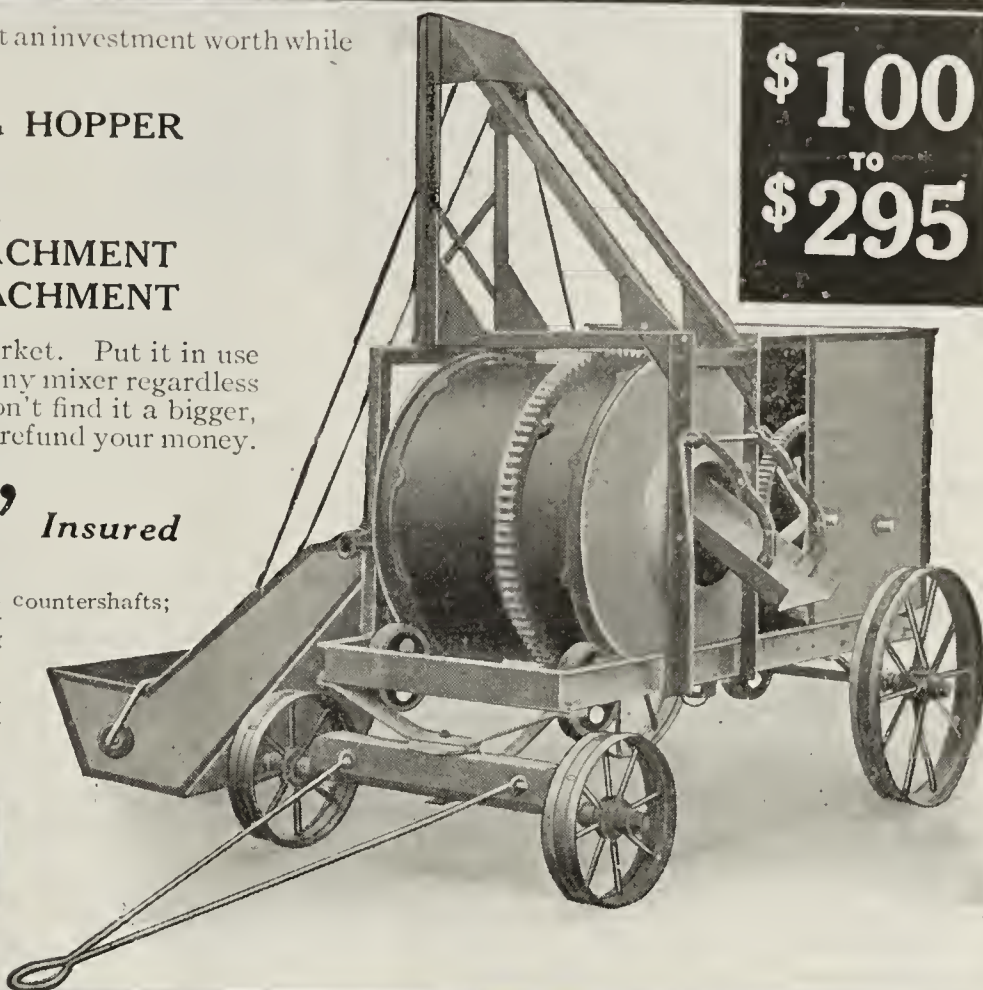
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The strongest and best built mixer of this class on the market. Put it in use anywhere. Haul it over the roughest roads. Put it up against any mixer regardless of price for quickness and thoroughness of mix and if you don't find it a bigger, better mixer in every sense of the word, send it back and we will refund your money.

Guaranteed REPUBLIC "SIX" Insured

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THE REPUBLIC IRON WORKS

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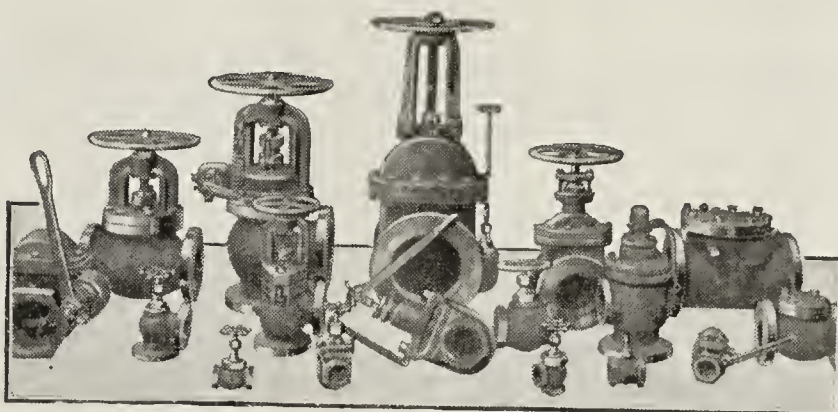
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Successors to the Erie Pump and Engine Works
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Largest Manufacturers of
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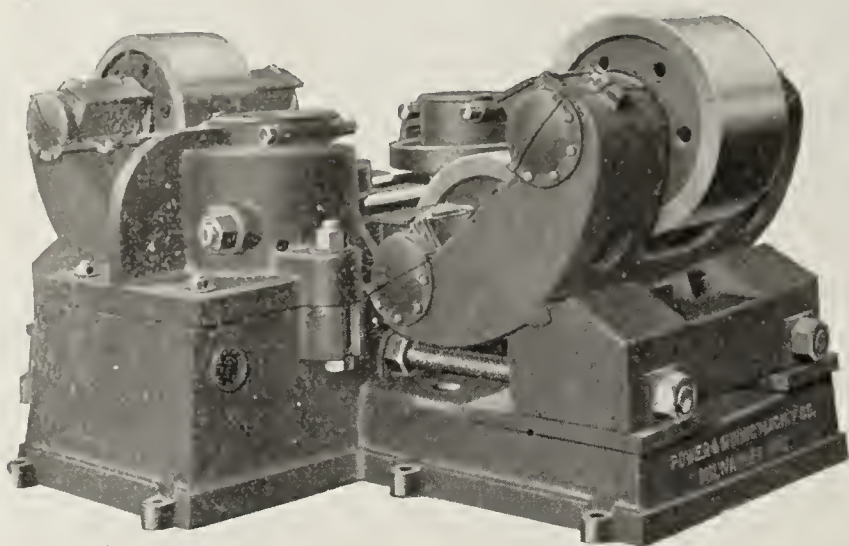
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As built by us for the past eight years—25 Kilns ranging from 8 ft. x 125 ft. to 10 ft. x 240 ft. Furnished to ONE CEMENT COMPANY besides a large number of smaller installations—this together with the fact that the design is being generally copied by our competitors is proof—**THAT IT IS THE BEST**—we also build Dryers—Coolers—Gyratory and Jaw Crushers, Pan Conveyors—Screens, etc. Send for Catalogue No. 7-108.

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STURTEVANT RING-ROLL MILL

For CLINKER, LIMESTONE and COAL
THE LARGEST PRELIMINARY GRINDER BUILT

CAPACITY PER HOUR ON CLINKER			
80 TO 120 BBLs.	TO 20 MESH WITH	80 — 90 H. P.	
50 " 80 " " 40 " "		80 — 90 H. P.	
50 " 60 " " 80 " "		80 — 90 H. P.	

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The Ring-Roll Tube Mill Unit can produce cheaper cement from every standpoint — upkeep capacity, low power and continuous operation than any other. Ask the users, they can prove it to you, and we can.

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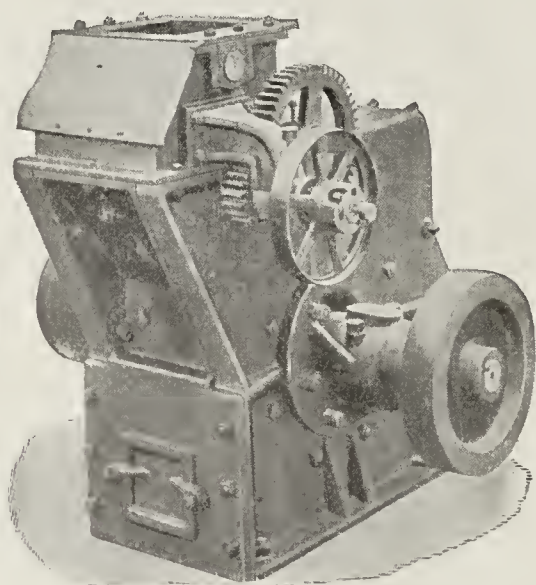
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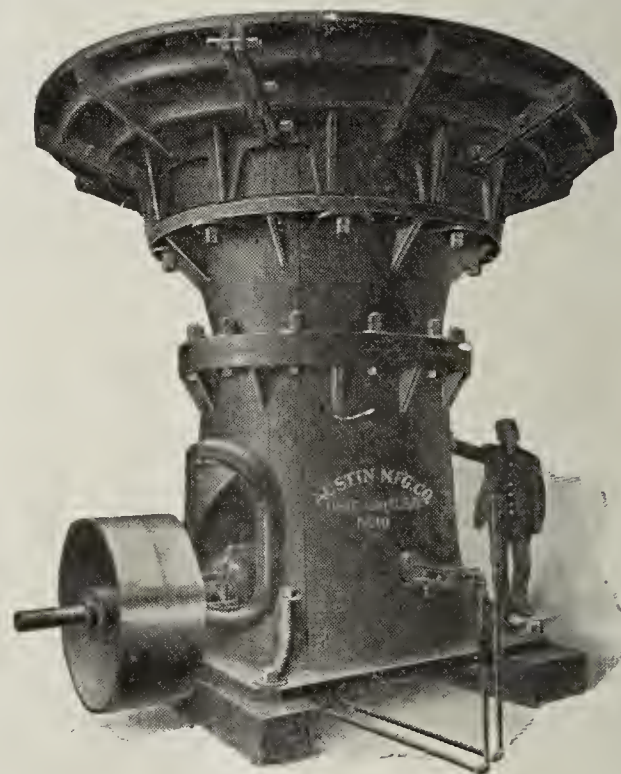
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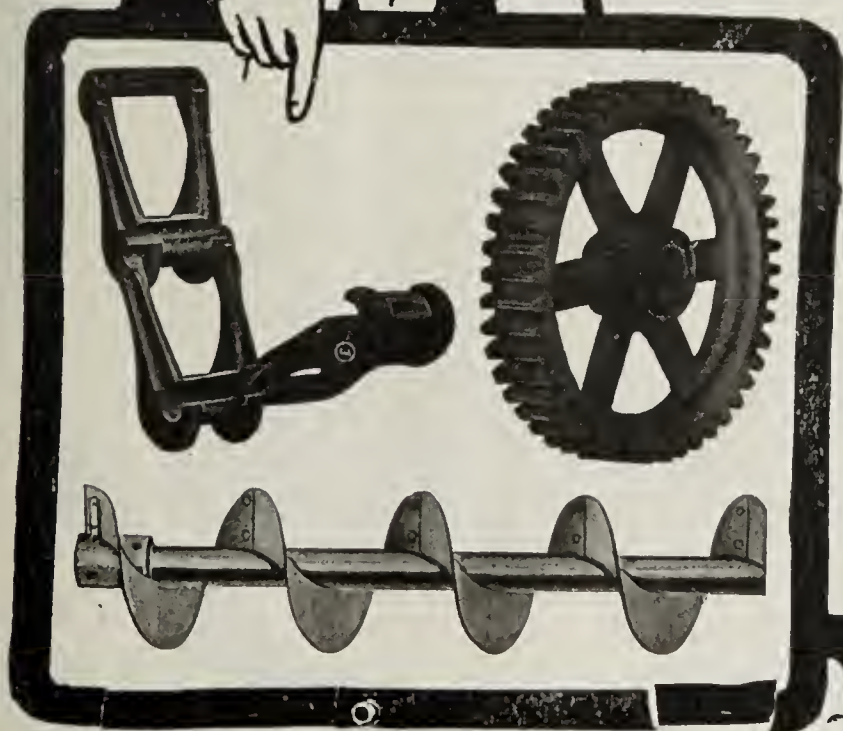


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FOR HANDLING SAND, DIRT, GRAVEL, CRUSHED STONE, ETC.

There are only two machines that will dig material that is met with, and they are the steam shovel and the dipper dredge. By using the Bishop Patent Excavator, any derrick having a rectangular or a square boom can be converted into a steam shovel or a dipper dredge made out of a derrick boat.

This apparatus can dig anything a steam shovel will dig, and

its range is from the base of the derrick to the end of the boom and below the base of the derrick the length of the dipper arm.



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steam shovel at work at the pit excavating sand and gravel when lower-cost equipment will do the same work? With your regular derrick you can dig material from the bank, you can excavate earth, you can handle loose materials on the construction job.

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SAVE MONEY AND TIME BY USING THEM

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The Strongest Paper Bag Made



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Years
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Give 50% to 100% additional service

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Grey Iron Castings from 1 Lb. to 35 Tons

Grate bars for all styles of dryers

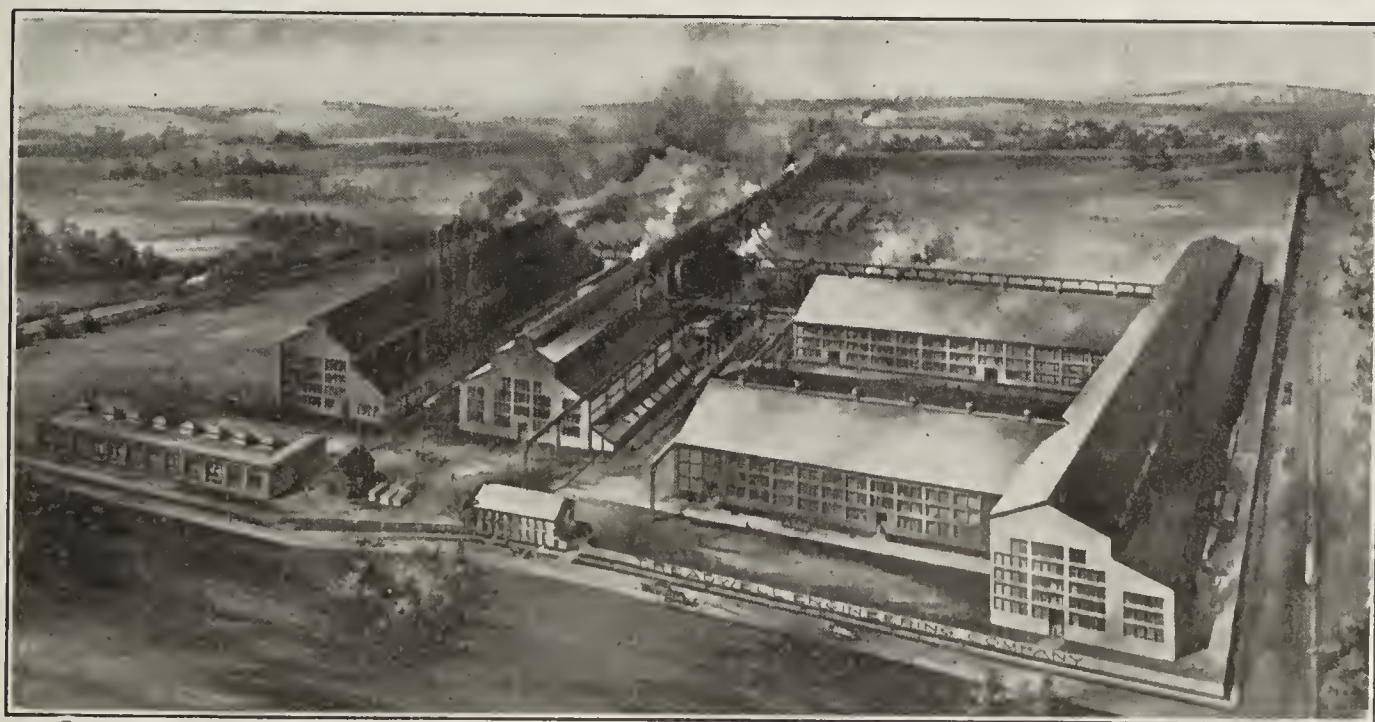
Rotary Kilns, Shale Dryers, and Grinding Mills

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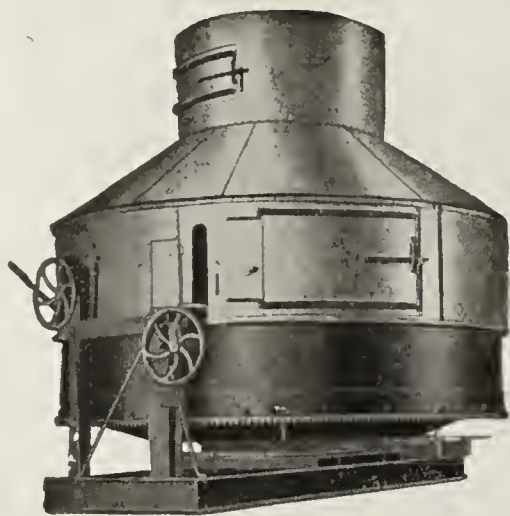
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Machinery Designed for Special Purposes



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"The Common Sense Way"

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IT does not take a "master mind" to install a CLYDE Hydrating plant, nor does it take a "high priced" engineer to run one. If **YOU**, Mr. Lime Manufacturer, realized how simple it is to obtain a PERFECT HYDRATE, with the CLYDE HYDRATOR you would place your order with us by FIRST MAIL. Write us today—NOW, and let us explain to you what CLYDE PROCESS hydrated lime is and how to obtain the best results, then

Use your own judgment—it's up to you

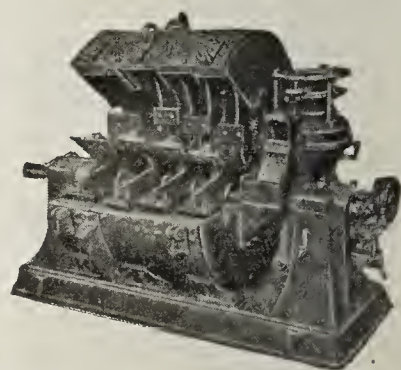
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BECAUSE

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The Chain that put the SHOVE
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Gear Spur Reductions made in any horse power and any reduction

Everything in Cut Gears

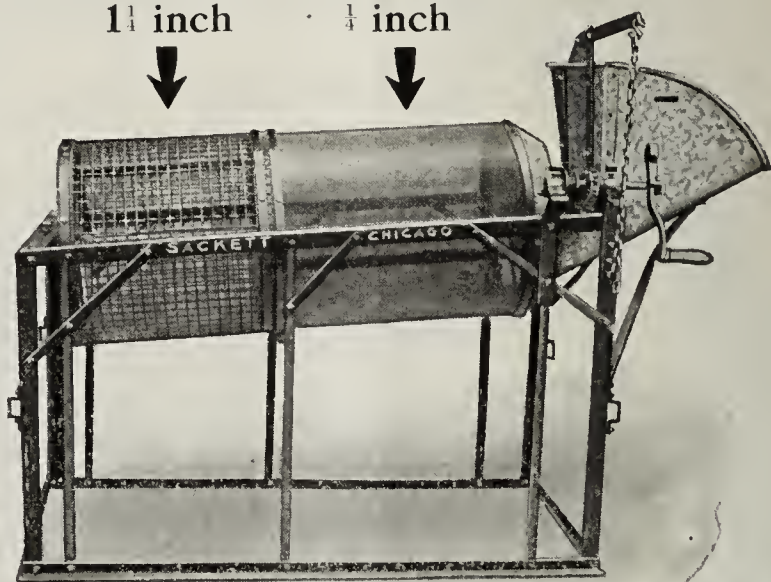
We have the largest plant in the West, equipped with the latest improved tools. Quick deliveries, low prices and first-class work our motto

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BROS.**

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210 to 220 N. Carpenter St.
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Bank-Run Gravel seldom has the right proportions

1 1/4 inch 1/4 inch



Since there is usually too much sand in proportion to the pebbles, *Cement is Saved* and a better concrete obtained by screening the sand from the pebbles and then remixing them in the right proportions. All pebbles larger than 1 1/4 inches are usually discarded. All material less than 1/4 inch is considered sand.

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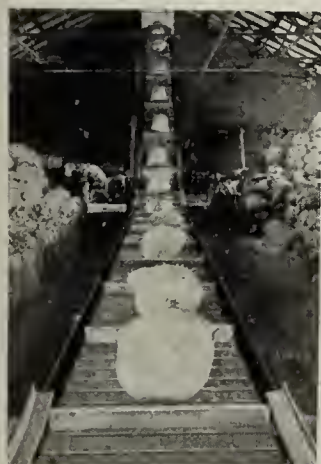
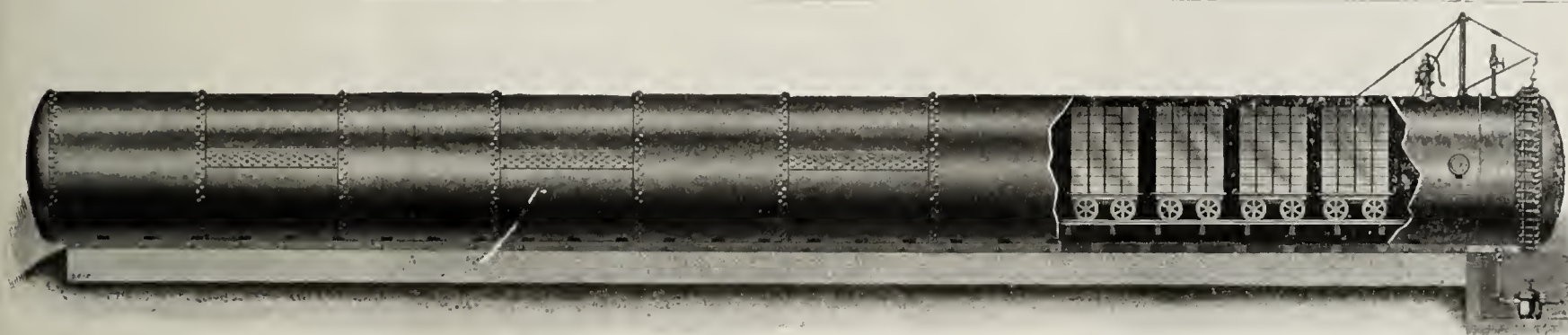
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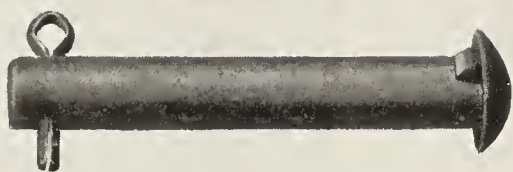
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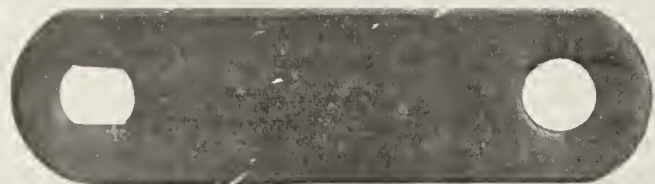
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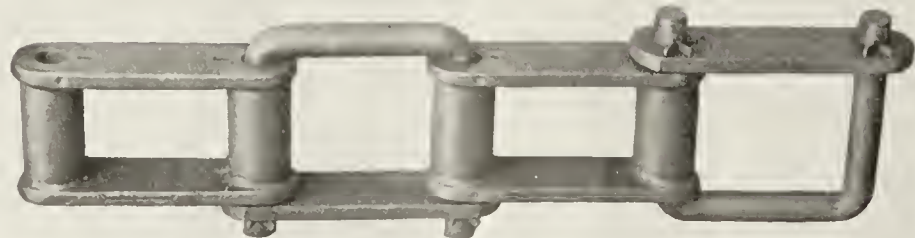
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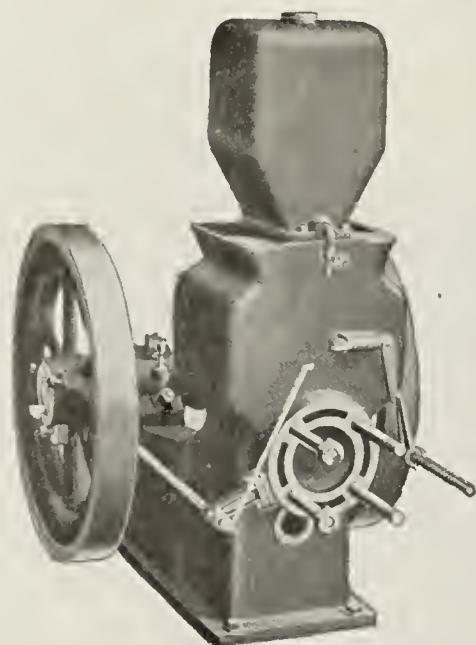
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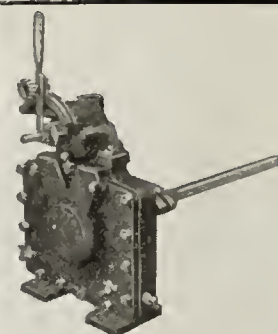
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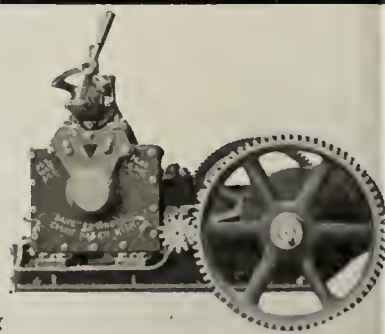


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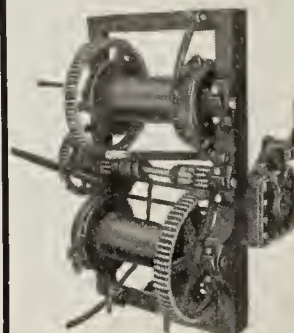
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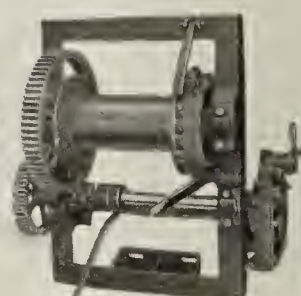
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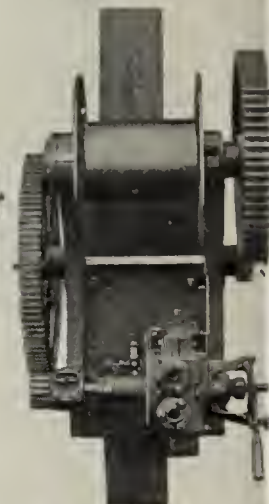
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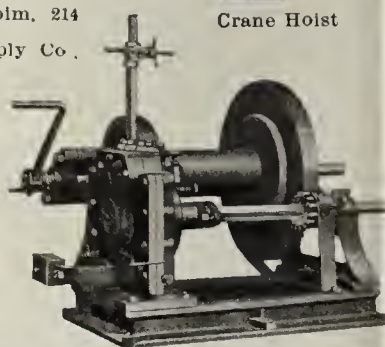
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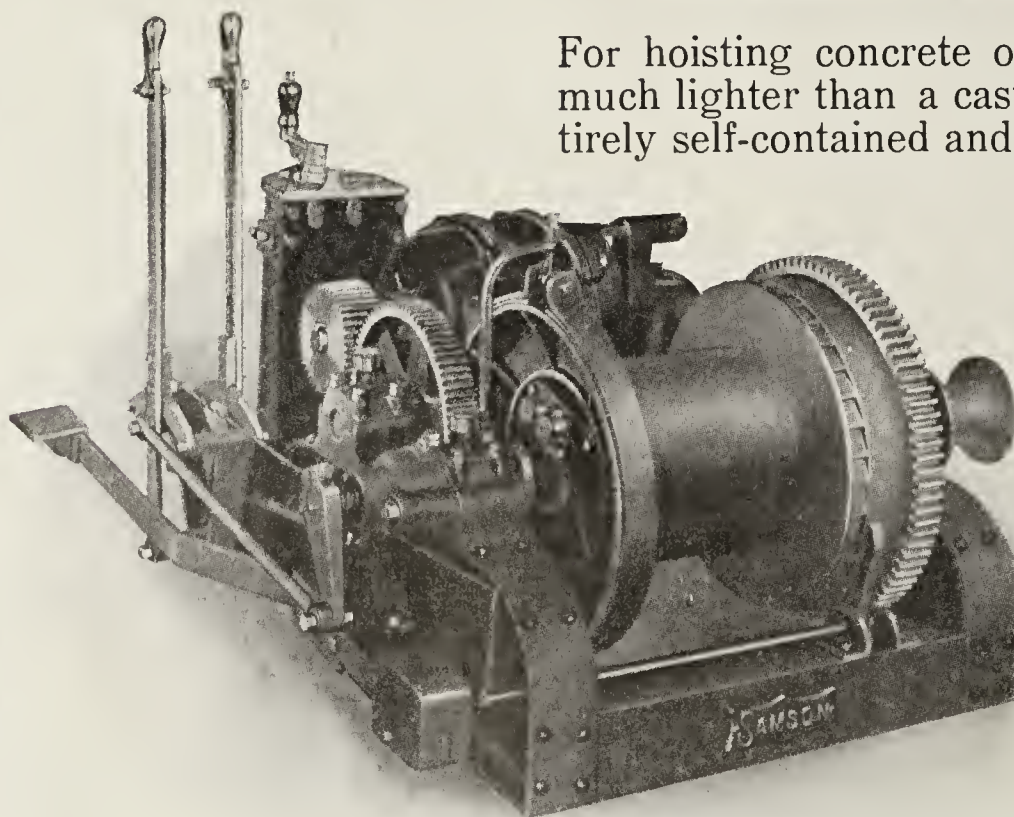


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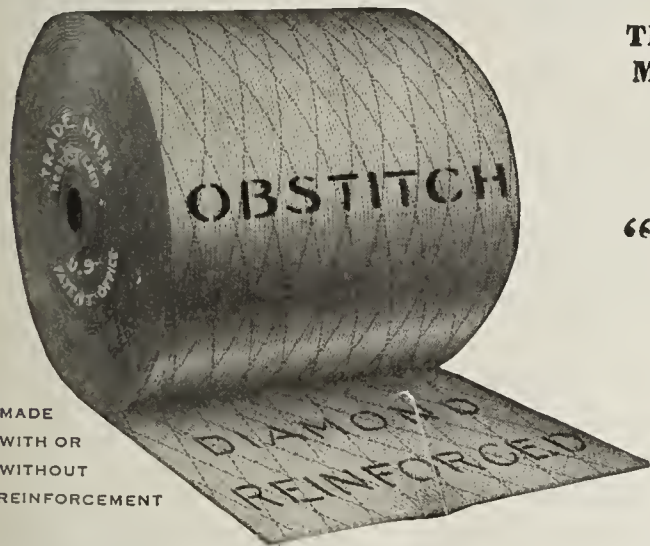
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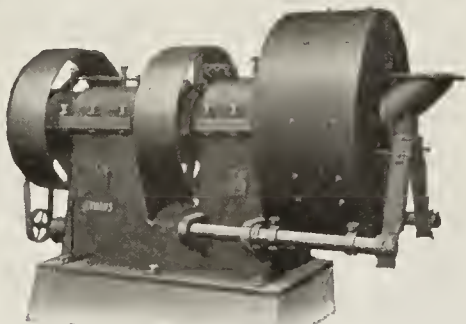
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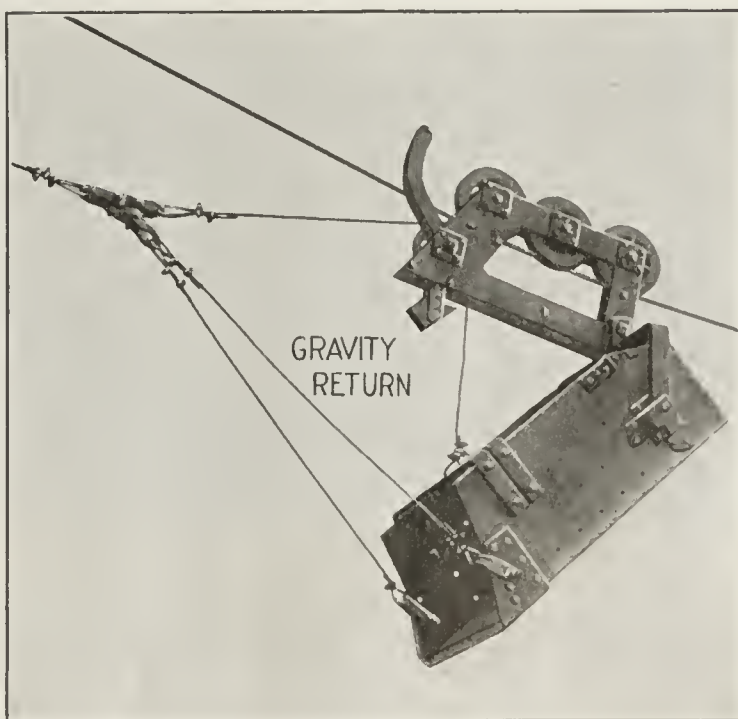
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CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

WILLIAM SEAFERT, Editor and Publisher

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CHICAGO, MAY, 1915

CONCRETE SILOS

This is the time to build concrete silos. Remember what the government says: "When every farm where stock is fed has a silo, an annual waste of nearly a thousand million dollars shall have been eliminated.

The greatest waste in any single industry in this country is made with the corn crop. The grain of the annual corn crop of the United States is worth on the farms one and one-half billion dollars. In a ripe corn plant 60 per cent of the feed value is contained in the kernels and 40 per cent in the stalk and leaves. With the grain worth one and one-half billion dollars, the feed value of the rest of the crop is a billion dollars. At least 90 per cent of the feed value of the stalk is lost under the present system of farm management—a waste with this crop alone of almost a billion dollars yearly.

The silo conserves the 40 per cent of feed value in the stalks and leaves.

The silo converts the waste roughage of the farm into stock food. It provides succulent food throughout the year, regardless of season; reduce the cost of beef, pork, and dairy products and paves the way for a better profit on the livestock and farming business.

About 70 per cent, or roughly, 75,000,000 acres, of our corn area is used to produce corn to be fed upon the farm. Husking and gathering this corn not only constitute one of the hardest manual tasks performed upon the farm, but is one of the largest items of cost in growing corn. An acre of corn land produces perhaps one ton of corn and eleven tons of stalks, blades and husks.

The corn is separated at great labor and expense, and then the eleven tons of feeding material is allowed to go to waste, an incumbrance in the field, except as a small part is utilized by the pasturing of cattle for a few weeks at the close of the year. It follows that on 75,000,000 acres devoted to the growth of feed for farm animals by far the greater part of the annual growth of feeding material is absolutely thrown away. The use of the silo will prevent this waste and make

it possible to utilize in meat-production twelve tons of feeding material per acre instead of the one ton now so utilized. About 40 per cent of the nutritive value of the plant is in the leaves and stalk. To produce this, the soil gave up a certain amount of its fertility, and any system of storage that keeps this fruitage of soil-energy from waste is a safeguard against soil depletion and ultimate want.

The silo does this.

O. L. REMINGTON VISITING UNITED STATES

Mr. O. L. Remington, General Manager, and Mr. McColl, chief engineer, of the Wm. McLean Co., of Melbourne, Australia, have arrived in this country for a visit to manufacturing plants with a view to investigating closely methods, machinery and new developments of the cement and concrete industries.

CONCRETE STORAGE BINS

The Builders' Supply Co. at Cumberland, Md., is having erected a sand and stone storage building which is somewhat of a departure from the usual type of structure used for this purpose. (See accompanying illustration.) The sand deposits and stone quarries operated by this company are some distance out of the city limits, and the material is shipped over the railroad to the city yards in hopper-bottom cars over an elevated trestle, from which the material is dumped into a storage yard for distribution by team and auto-truck.

The sand and stone were previously loaded into wagons by hand, and with a view to not only increasing the storage capacity, but obtaining a more economical method of handling the material, the company investigated the various types of storage buildings and selected a set of concrete bins. The view herewith was photographed during the construction of the building, before the machinery was installed, and shows the concrete bins completed with the forming for the roof slab still in place. The building is entirely of reinforced concrete, 89 feet long, 30 feet wide and 56 feet 8 inches high to top of roof slab. The first story forms a support for the bins, and contains two driveways running under bins lengthwise of building. Each driveway is 9 feet 6 inches wide, and has a clearance of 9 feet 8 inches in height to accommodate the largest auto-truck. The piers on which the columns rest extend above level of driveways and form a curb, the edges of which are armored with steel, and the exposed corners of the columns are encased with angle iron to prevent wear from the trucks.

A warehouse, three stories high, is being built adjoining one of the driveways, and it will be arranged to have a loading platform extending on ends of bins on a level with second floor of warehouse to facilitate loading out of mixed loads of building material and also allow loading and deliveries to be effected in stormy weather. Openings are left through the outside wall of driveway on opposite side of storage building for windows and doors.

On account of the limited room at the ends of the structure, and to permit better turning facilities for the large auto-trucks on entering and leaving the building, the first story was shortened and the bins designed to extend over the foundation line. Above the driveways, and forming the bottom of the bins, is a heavy reinforced concrete slab, through which are openings and spouts for loading wagons and trucks. Each bin is fitted with a heavy cast-iron especially designed spout, with undercut valve and operating lever arranged so

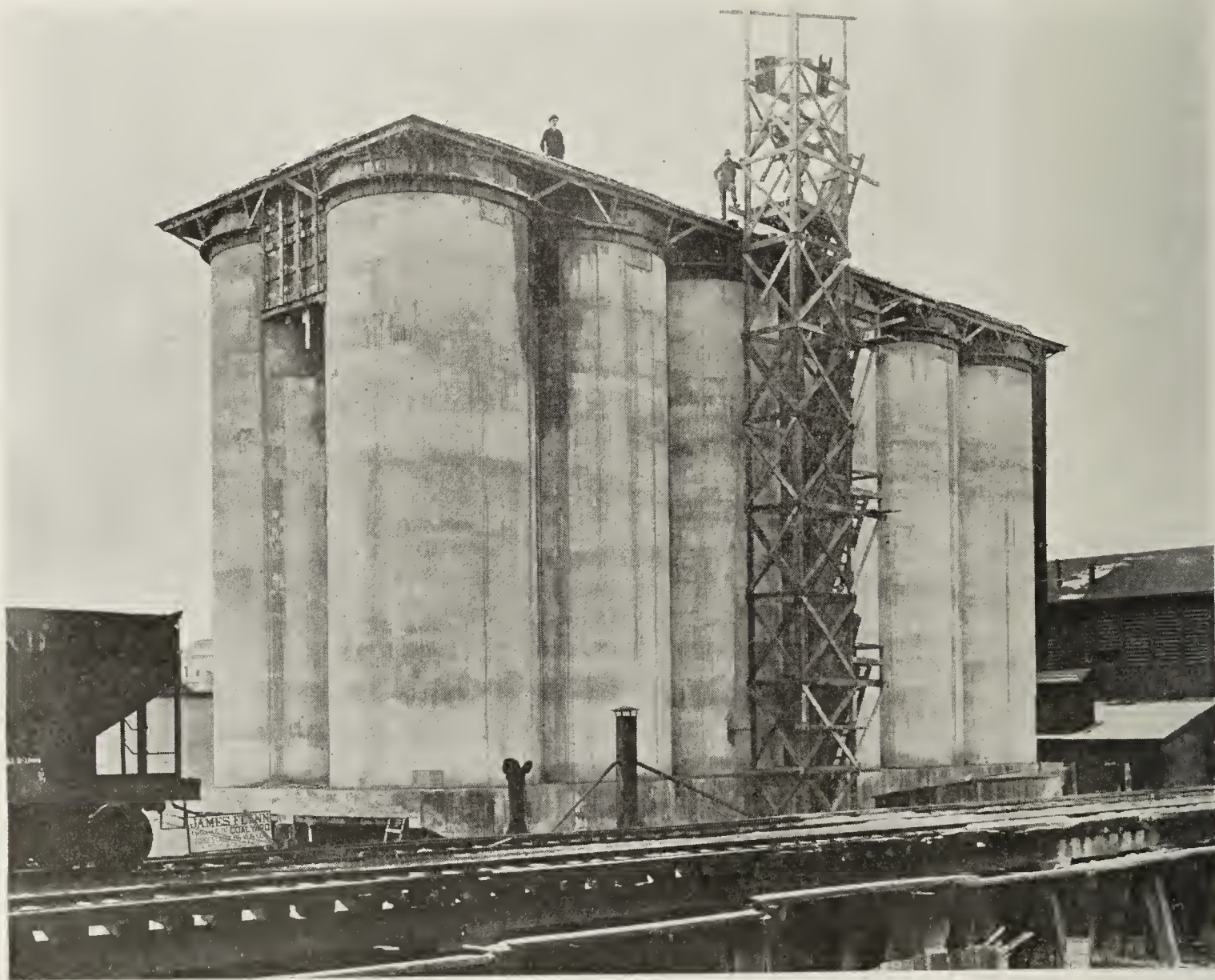
that the driver can control the loading of the material in the trucks. The bin story is divided into 12 circular bins, 14 feet in diameter and 36 feet deep, arranged in two rows of six bins each, and forming five interstice bins that are utilized for storage. The bin walls are monolithic, and were constructed continuously day and night by means of a moving form, provision having been made to enclose the walls and protect the concrete with steam heat during the cold weather. Above the bins, and formed by the continuation of the circular walls, is a cupola, which contains a concrete walk extending longitudinally over the bins. The cupola is covered with a concrete roof slab, above which is built a penthouse enclosing the elevating machinery and motor.

access to the machinery.

The power is furnished by two electric motors with belt and gear connections. The storage building was designed and erected by Deverell, Spencer & Co., Garrett Building, Baltimore. The machinery was furnished by the Weller Manufacturing Company of Chicago.

CONCRETE PAVEMENT

The first concrete pavement constructed in Schenectady, N. Y., which has recently been completed, has some interesting features. It is a one-course pavement, 7 in. thick, of 1:2:4 concrete, made of crusher-run stone graded to 1 in. in size. Expansion joints are placed at an angle of 75° to the curb. Wil-



Concrete Storage Bins for Sand and Stone.

The openings at the ends of the driveway are fitted with Wilson steel roller doors and Lightwell steel windows with ribbed wire glass are placed in the cupola. Entrance doors are placed on each side of the cupola, and at the end is a large metal-clad door to provide for removal and replacing of machinery. The building and machinery equipment are arranged so that sand and crushed stone can be received in hopper-bottom cars and dumped into a track hopper at the side and near one end of the building. After being deposited in the hopper the material is fed through a spout with controllable gate into a double-strand chain bucket elevator, which conveys the material to the top of the building and discharges into a spout with a special turnhead. This turnhead connects with spouts leading direct into the nearest bins, and also discharges on a belt conveyor that runs lengthwise of the building over the bins. The belt conveyor is fitted with an especially designed heavy steel tripper with spouts arranged to discharge into the different bins. The walk over the bins is fitted with steel hand rails and necessary platform, and ladders are provided to give

son B. Landreth, city engineer, writes to us, under date of Oct. 27, that "while theory could easily prove that there is no advantage in placing the joints at an angle to the curb, we have decided to give the diagonal joint a practical trial. It is not straining anyone's credulity, however, to believe that the weight of a vehicle may be carried across such a small depression on three wheels." The street is 24 ft. wide, and these expansion joints are placed every 20 ft. These expansion joints are 1/2 in. wide and are filled with several varieties of joint filler, the intention being to observe the action of these various fillers during the fall and winter, in hopes of finding the most suitable one for the given conditions. In constructing the pavement, the gutters have been made deep enough, and the crown of the pavement is of a shape, that when the pavement is worn to an extent to make repairs no longer economical, the city will be able at moderate cost to place on the old concrete a 2-in. asphaltic-concrete surface. This is the first real concrete pavement in the city, although a short experimental strip was built some years ago.

An All-Concrete Barn

The Details of Design and Construction of a Permanent Farm Barn

By E. S. Fowler

Farm buildings are the farmer's factory. In them raw materials are converted into finished products. The food grown on the farm may be compared to the raw materials in manufacturing, and the milk, butter, cheese, beef, pork, etc., to the finished products. As the manufacturer carefully considers the design of his factory, in order that the work done in it will be economical and efficient, so the farmer should carefully design his farm buildings that the animals housed in them will be comfortable, enjoy good health and receive the greatest possible benefit from the feeds given them; also that the least amount of time and labor will be required in caring for them.

Much depends upon the individual needs of each farmer as to the design of his buildings. A great mistake is made when one farmer duplicates what another uses to advantage without considering its adaptability to his own needs. The size of the farm, its environment and building site are all important factors in designing the buildings.

Pure Air, Pure Water and Pure Soil

Pure air, pure water and pure soil are essential requirements of every building site. Naturally this would call for the highest elevation on the farm. This, however, is not always possible. Nevertheless, the site selected must be such that the circulation of pure air and abundance of sunlight will not be obstructed. Pure water and good drainage, preferably natural drainage, are very important because of the sanitary conditions involved.

The appearance of the buildings is due, to a great extent, to the landscape surrounding them. Much of their attractiveness, however, depends upon their design, and need not be an added cost of construction.

An All-Concrete Barn

As an example of what can be accomplished in permanent building construction, I will describe the design of an all-concrete barn planned and built during the year 1913 on Mr. A. J. Fowler's farm at Sheridan, Illinois.

The farm, which this building serves, contains 217 acres of land. About thirty acres of this would never be suitable for cultivation, but are excellent for grazing. Consequently, a certain amount of stock must be kept for this purpose. The natural environment of the farm is particularly adapted to either stock raising or dairying, but at the present time is farmed principally for grains and hay.

Permanent System of Fertility Planned

By continuing this method of farming without returning fertility to the soil the farm would soon become a non-paying investment. In view of this, stock raising promises the greatest cash returns, and will, therefore, become the permanent system of farming on this place.

All the buildings on this farm were old and dilapidated when it came into the possession of the present owner. After deciding upon the kind of barn needed, and investigating the cost of such a structure in wood, it was found that this was slightly less than the estimated cost of the all-concrete structure. The building spot was chosen midway between the present corn crib and the old wooden barn. This site was chosen for efficiency, the object being to save time and labor.

Size of Barn

The shape of the barn is rectangular, 34 feet wide and 54 feet long.

The first story provides stabling room for eight horses and twelve cows. The stock stand in two rows facing the outside walls. A feed alley is provided the entire length of the barn in front of each row. Extending lengthwise through the center of the barn is a driveway that permits the collecting of the litter with a manure spreader which can then be hauled directly to the fields. In the center next to the cow stalls, on each side of the driveway, are two small grain bins. Crossing the barn, between the grain bins and horse stalls, is a passageway leading to the feed alleys. At each end of this passageway is an outside door, so located in view of future building. The second story is for the storage of hay and straw.

Concrete Floors

The driveway, cow stall and feed alley floors were made of concrete mixed in the proportions of one part cement, two and one-half parts sand and four parts screened gravel. The horse stall floors were made of concrete mixed in the proportion of 1:2:3, because of the greater wear they would receive. The surface was struck with a straight edge, and then finished with a wooden float. This left a surface of the desired smoothness, and one that would not become slippery with wear.

Horse Stalls

Reinforced concrete was used in making the horse stalls, partitions and mangers. These partitions are 4 feet 6 inches high and 4 inches thick, reinforced with one-fourth-inch round rods spaced 12 inches on centers, both vertically and horizontally. Every alternate partition centers on a reinforced concrete column. On top of the partitions are steel guards 28 inches high fastened by the bolts embedded in the concrete. The mangers and feed boxes are 3 inches thick, reinforced with one-fourth-inch round rods. Only one set of forms was used for constructing the horse stalls.

The scheme for tying the horses to the manger was accomplished by the use of an eye bolt. This, however, could not be inserted when the concrete was placed, because it would necessitate tearing the forms apart when removing them. Therefore, a half-inch bolt containing nut and washer was inserted through the form into the concrete which formed the feed box. When the concrete had partially hardened the bolt was removed, and an eye bolt inserted into this hole and turned into the nut.

Cow Stalls

Let it be remembered that the cows stand facing the side walls of the barn. The entire distance from the edge of the gutter at the driveway to the walls is 12 feet 7 inches. The gutter is 18 inches wide. It is 3 inches below the driveway floor and 8 inches below the stall floor, and the bottom has a slope of one-fourth inch to the rear. This causes all liquid to accumulate at the farthest distance from the stall, which insures greater cleanliness.

The cow stall is 4 feet 8 inches long. Fourteen inches from the manger curb and the full width of stall is a depression three-fourths of an inch deep. This serves the purpose of holding the bedding under the animals' front feet, and offers a toe hold when reaching for food in the manger. From this depression to the gutter there is a slope of one inch for drainage.

The manger curb is 10 inches high and 5 inches thick and is scalloped out under the stanchions to within 6 inches of the floor. All corners are rounded and made

smooth. The manger is 2 feet wide and with a curved bottom. The feed alley is 4 feet wide and extends from the top of the manger to the wall.

Foundations

One and one-half tons per square foot was used as the allowable bearing pressure on the soil for all foundations.



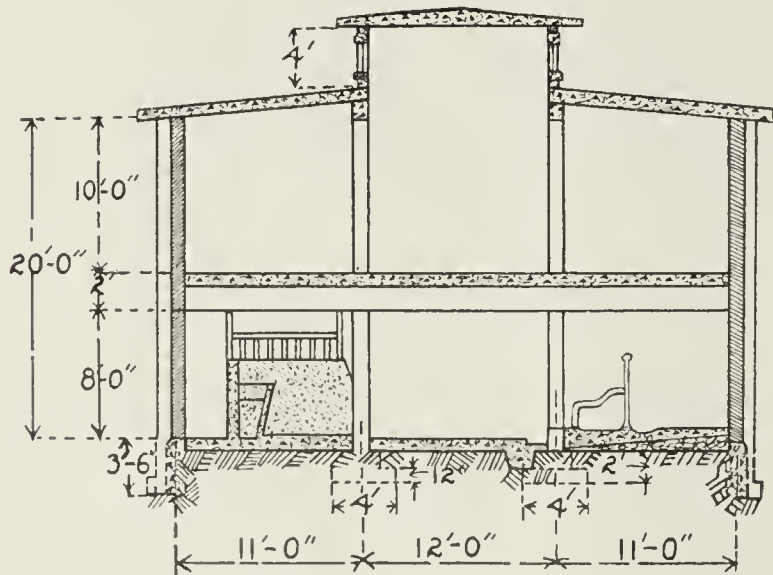
Cow and Horse Stalls in Mr. Fowler's Barn at Sheridan, Ill.

In view of this the column foundations were made 4 feet square and the reinforcing rods for the columns set in them when they were constructed.

The wall foundations were made 15 inches thick at the bottom and extend $3\frac{1}{2}$ feet below grade in order that the footings may be beneath the frost line.

Concrete Blocks

Anchor, continuous-air-space, concrete blocks were used in the walls of this building made with an anchor concrete block machine near the site. These blocks are so constructed that they form two separate walls having no concrete connection between the outer and



Cross Section View of All-Concrete Barn.

inner surfaces. These two separate walls, however, are held together by 4 steel rods for each block, the bent ends of which are imbedded in both sides of the concrete block when made. When these blocks are placed in the wall they afford a complete air space around the entire building. The total number of blocks required was 2,326, the average cost of which was 11.8 cents each.

The sand and gravel used for making the concrete blocks, as well as for the other concrete work, was secured from a gravel pit located on the farm. Tests

of the sand from this gravel proved that it was clean and well graded. That part passing a three-fourths-inch screen was used for making the blocks. For all other concrete work this material was separated into sand and gravel and remixed in the required proportions.

Concrete Columns

On each side of the driveway is a row of columns, 12 feet apart between rows. Lengthwise of the barn, these columns are spaced 10 feet 8 inches apart on centers. This spacing was necessary for arrangement of the stalls.

The design of the columns to support the haymow floor required an effective area of 88 square inches. A column 10 inches square was used. Each column was reinforced with four eleven-sixteenths-inch round rods, extending through the beam into the haymow column, where they were spliced with the rods in this column.

The columns in the haymow were made the same size as in the first story to avoid rebuilding the forms. They were each reinforced with four one-half-inch rods, two of which extended through the monitor walls and were anchored in the monitor roof.



Hay Loft in Mr. Fowler's Barn.

Pilasters

The pilasters in the side walls, which were made of monolithic concrete reinforced with two one-half-inch round rods, are veneered on the outside with concrete blocks, 4 inches thick, 8 inches wide and 24 inches long. These blocks overlap the two concrete block curtain walls, 4 inches on each end.

Haymow Floor

Reinforced concrete was used for the haymow floor. It was designed for a live load of 100 pounds per square foot which is equivalent to the weight of well-settled hay 20 feet deep, or baled hay 62-3 feet deep. The former condition would never occur, but the latter would be probable, especially in the west end of the building in which the haymow floor is located. This load required a concrete floor 5 inches thick reinforced with one-half-inch round rods spaced 6 inches on center for transverse stress and 16 inches on center for temperature stress. The concrete was mixed in the proportions of 1:2:4, and the surface finished with a wooden floor. Two hay chute holes were left in the floor near the outside walls in the middle of the barn above the side doors. Another opening was left 2 feet square in the center of the barn beside a column for the ventilator shaft.

This floor received a test load by the concrete blocks which were stored upon it prior to the construction of the second story block walls. The estimated load was 140 pounds per square foot. No noticeable deflection nor any sign of cracking was evident.

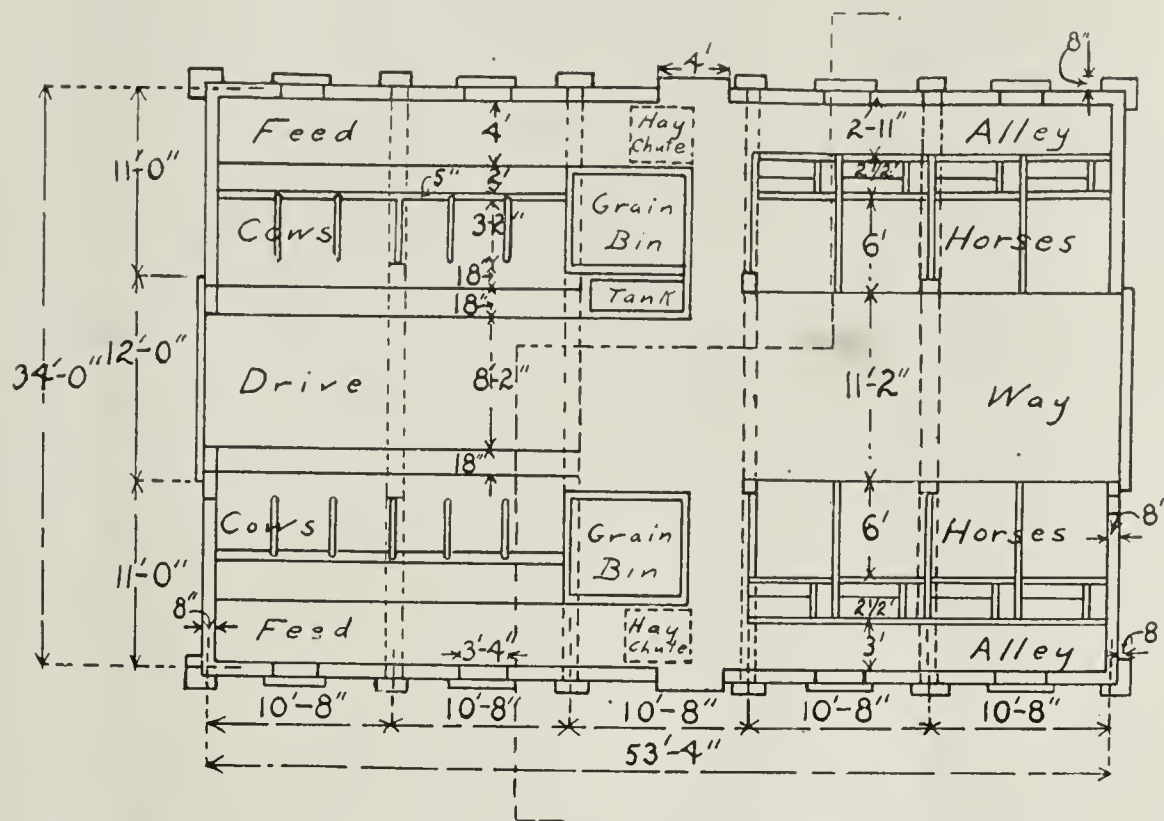
Concrete Beam

The reinforced concrete beams which carry the haymow floor are spaced 10 feet 8 inches center to center. They are supported at the ends by pilasters in the

possible within one inch of the top of the slab—the place where the greatest temperature stress occurs.

The hay track is attached directly to the roof of the monitor by means of inverted U-bolts imbedded in the concrete straddling a one-half-inch round rod.

The concrete for the roofs was mixed in the proportion of 1:2:3. The exposed surface was struck with a straight edge and finished with a wooden float. When it had hardened sufficiently to permit sprinkling, it



Plan View of Mr. Fowler's All-Concrete Barn.

walls, and on each side of the driveway by the reinforced concrete columns. These beams were figured as T-beams continuous over two supports. Three seven-eighths-inch round rods were used for reinforcing. At each support they are reinforced with three-eighths-inch round rods for shear.

Concrete Roof

The monitor type of roof was chosen. It consists of flat sloping roofs over the two side bays, having a span of 11 feet, supported by the outside walls and a reinforced concrete beam, carried by the concrete columns in the interior. Above this concrete beam are the walls of the monitor made of reinforced concrete, 6 inches thick and 4 feet high, which support the monitor roof. In these walls at each end of the barn are two windows which afford ventilation and light to the haymow.

The side roof slabs are 4 inches thick, reinforced with three-eighths-inch round rods, spaced 4 inches on centers for transverse stress, and 8 inches on center for temperature stress. All the transverse rods extend into the monitor wall instead of the beam.

The monitor roof is 3 inches thick at the eaves and 9 inches thick at the center, reinforced with one-half-inch round rods, spaced $4\frac{1}{2}$ inches on center for transverse stress and 2 inches on center for temperature stress. The design for this roof called for a thickness of 6 inches at the center, but it was found that, by reducing the thickness of the roof at the eaves to 3 inches, and increasing the thickness at the center to 9 inches, the pitch would correspond to the side roofs and at the same time the allowable shearing stress of the concrete would not be exceeded at the supports.

In all cases the temperature rods in the roof, which extend lengthwise of the barn, were kept as nearly as

possible within one inch of the top of the slab—the place where the greatest temperature stress occurs.

Economy of Monitor Roofs

Flat roofs of monitor type afford a most economical loft, because a minimum amount of space is occupied by posts and braces. The estimated capacity of the loft of the concrete barn is 40 tons. Only 56 cubic feet is occupied by the concrete columns—the only obstruction. Thirty-three loads of hay were put in this barn last summer (1913), and the last bent was



External View of All-Concrete Barn.

only one-quarter filled; also much space was still available in the monitor. The cost of the concrete roof complete was about 25 cents per square foot.

According to the estimate of a rural contractor, gable roofs of timber construction cost from 12 to 25 cents per square foot depending on the kind of construction and the grade of materials. The estimated cost of a first class wooden roof, such as could be compared to the concrete roof of the above barn, was 19 cents per square foot.

It would appear that the first cost of the concrete roof compared with a wooden roof would be 6 cents per square foot greater. The first cost of the concrete roof, however, was actually less than the above wooden roof would have been, because of the lesser number of square feet of roof surface. The concrete roof cost \$575, and the contractor's estimate of the wooden roof was \$637. If it be said for the wooden roof that it will afford more loft space, it can be said for the concrete roof that this can be accomplished by building the walls higher to obtain the cubic contents.

Value of Permanent Construction

In a similar way other farm buildings can be built of permanent construction. While the first cost will exceed slightly that of other construction, yet the permanent buildings will be the cheaper because the cost of painting, shingling and renewing floors, mangers and roofs will be eliminated. The cost of the finished concrete barn was about \$2,600. The estimated cost of a wooden barn corresponding to the design of the concrete barn (mortised and tennoned framing) was \$2,100.

First Cost

The first cost is often the only point considered by the farmer, who proposes to build. Moreover, he does not consider that this building may house a single animal whose value is greater than its total cost. If it is not of permanent construction, its destruction by fire may mean a loss of twice its value.

The difference in cost between timber and concrete construction cannot be determined by any one list of figures. It varies in the cost with the location, the type of building and its capacity.

Generally speaking, the first cost of permanent building will exceed that of first class mill construction by from 15 to 25 per cent, but after a few years' service the two will have cost an equal sum, because of the expense due to insurance, maintenance, etc., necessary for the latter, besides the loss due to the invasion of vermin.

Permanent farm buildings add an intrinsic value to the land. Modern improvements on a farm of 160 acres cost all the way from \$25.00 to \$50.00 per acre. Farms with permanent buildings are, therefore, better investments than those with perishable structures.

Concrete is particularly adapted to farm structures because it can be so easily and rapidly manipulated. "It grows in strength for considerable length of time, and after having attained its ultimate strength it never weakens."

Farmers are recognizing the value of, and are building permanent and attractive farm structures. As a noted educator has said, "Permanent farm structures are a sign of progress."

NEW HYDRATED LIME PLANT

The Saginaw Lime & Lumber Co., Saginaw, Alabama, just completed the installation of a hydrating and grinding plant here, and will manufacture hydrated lime and also ground limestone for agricultural purposes. The use of agricultural lime is steadily increasing, and it is in response to the growing demand for this product that the company installed this grinding plant.

INCREASING THE EFFICIENCY OF TRAVELING SALESMEN

By P. B. Beery *

The old saying, "salesmen are born not made," is far from the truth nowadays and it probably originated during the time when a man was given his samples, price list, route, etc., and sent on his way with a handshake and a "wish-you-good-luck."

Under those conditions he confirmed the belief that he was born for the job, or he proved unsuccessful and someone else was given a trial.

No effort was made either by the employer or on the part of the salesman to increase his efficiency, consequently, the amount of expense money, business and good material in the shape of salesmen that has been wasted, if figured in dollars and cents, would represent a huge sum.

It is quite true that a man to become a success as a salesman must have in him the makings, so to speak, which primarily consist of honesty, energy, sobriety, personality, diplomacy, loyalty, tenacity, optimism, enthusiasm, and last, but not least, the necessity of making good.

These are only a few of the fundamental requirements, and off-hand, it would seem a rather hard order to fill.

The requirements not mentioned and all of those named, excepting personality, can be developed by the man who desires to become a successful salesman, especially if he is in the hands of an efficient sales manager.

Old school men in charge of sales departments have been reluctant to believe that there is anything to scientific salesmanship and generally class it as so much theory, much to the detriment of the house that retains their services.

A salesman with them is either good or bad, gets the business or don't get it, and why he gets it or don't get it is of no importance, and how he gets it is of less.

Sharp practice or surreptitious misrepresentation on the part of otherwise good salesmen has been fostered by him or is intentionally overlooked.

Taking the requirements of a salesman in their order, as they appear above, the one of honesty is of vital importance.

Any salesman or firm can get an account by misrepresentation but they cannot retain it, and if there is one asset above all others that is worth developing and which in the long run spells success it is the reputation a firm establishes with the assistance of its salesmen for honesty and reliability.

One of the best and most helpful selling points a salesman can have is that his house is absolutely reliable and that he, as its representative, cannot afford to be otherwise.

Salesmen and sales managers must put themselves in the buyer's place from time to time when studying efficiency, for example; we all prefer and do buy as far as possible from honest and reliable concerns even when we know that we are paying just a little more for the same article than were we to purchase elsewhere. The reputation of a firm in this respect unquestionably helps to secure a fair price with a reasonable profit.

There is not one chance in a thousand that any firm which maintains such a reputation will impose unreasonable prices on its customers; in other words, its reputation is not for sale. If a firm's reputation for honesty and reliability will secure trade at an honest price and retain that trade, it is easy to figure how much time and thought can be spent profitably in developing and maintaining that quality in the salesman.

* Sales Manager International Portland Cement Co., Spokane, Wash.

Energy is probably the most fickle of all the requirements necessary. A so-called dead engine has energy but that energy is of no value unless there is a sufficient amount of steam in the boiler and unless the throttle is operated by one who can utilize it to the best advantage.

A man may think he has all the energy there is and may start at his work with the best of intentions; he must, however, always bear in mind that there is a road paved with good intentions and that if he expects to remain on the road he had better not go where that particular road leads. Let the average salesman experience a day or two of rough weather or hard luck with little or nothing to compensate him for his tireless efforts and perseverance and ten to one he will become discouraged, disheartened, blue, pessimistic and everything else that is bad. If he don't there is something the matter with him, and in either case it will be found upon application that what was required was the further opening of the throttle, or, in other words, the turning on of a little more steam.

There is no man living who does not prefer doing the easiest things first, and as there are many duties that are seemingly hard and which fall to the lot of a salesman, he should cultivate the habit of doing the hard things first. For example: there are two parties who must be seen, one of them is always glad to see you and generally gives you an order, while the other, possibly a more valuable account, is hard to approach, generally preoccupied, and, on the whole, not pleasant to call on.

As there is always a satisfaction in accomplishing something worth while, and as any one can become an order taker, one should try the experiment of becoming a salesman and call on the toughest proposition first. Do not go at the job expecting to get a frost and with the intention of merely making a party call, but do so with the firm conviction that you are going to add a new customer to your list, or at least plant a fertile seed.

The more successes of this kind you achieve, the easier your work becomes; the more proficient you become; the more readily you learn to overcome obstacles; and in time nothing will seem impossible. In fact, the more difficult the task the more interesting.

Only a few words on the subject of sobriety. One must have a clear head and brain to work successfully, otherwise there is a tendency to get after-witted, in other words, after leaving a prospect you think of what you might have done or said that would have brought more satisfactory results.

Diplomacy on the part of a salesman is the shrewdness he displays, not meaning sharp practice but the skill or art of knowing how to approach, humor, and handle various types of men. To say just the right thing at the right time; to let the buyer do most of the talking if he is so inclined; to know the opportune time to conclude a transaction; to know when to leave; to be able to more or less read characters and discover or see promptly what line of sales talk appeals to your prospect.

A diplomatic salesman never stoops to criticize competitive goods, but by telling the merits of his own line, the services his house gives, etc., he will make the desired impression and avoid antagonizing. It does not pay him to have strong political convictions and his prospect's views are generally conceded as being right in every respect, excepting when they do not flatter the product he sells. Even then he can change those views in a courteous but convincing way, especially if he knows his line thoroughly and is properly posted on his goods, as all salesmen should be.

A salesman's loyalty to his house and their product

is imperative. No salesman can make a success unless he has every confidence in both, and, try as he will, disloyalty or lack of confidence in either will be perceptible in his conversation, expression and manner, for the same reason that your face is to a great extent a mirror and reflects in conjunction with your conversation your true character, feelings, etc.

A salesman's success is to a great extent based on his loyalty to his company. It is greatly to his advantage if he will decide that he is to continue to work for the company he is with and to become their best man rather than for him to be dissatisfied and constantly looking for an opening with some other concern.

The sales manager should impress on his men and with success, if he will figure out in various territory how much it costs his different salesmen to sell goods and then let it be known that the salesman's salary will be based from year to year on the work and results accomplished.

In some cases he will have to reduce, but the majority of his men, if of the right sort, will earn an advance in compensation.

In this way he is paying the man all he is worth, either to him or to any other company in the same line. If a salesman knows that he is being paid on this basis he is sure to conclude that he can get just as much, if not more, in return for his energy as were he to work for another company on a doubtful basis.

This will cause him to be loyal and work with renewed vigor toward bettering his condition and increasing his sales.

Tenacity means in this connection—never give up, never become discouraged; figuring out new methods of attack; knowing that one must eventually succeed; being tireless in one's efforts to attain what he goes after; never get to the point where he thinks he has done everything possible, but realize that courteous soliciting and friendliness pays, and in many cases will give him an opening when all other tactics fail.

Remember that every house loses accounts occasionally and that something may occur that will cause him to secure the account he is after provided he has been persevering.

Optimism will get the salesman more business than a long face and a hard luck story. If the salesman is not complaining, cheerful and apparently prosperous, it indirectly implies to his prospect that his goods have special merit and are worthy of his consideration. It takes the customer's mind off of his own troubles, if he has any, makes him look on the bright side and may possibly cause him to do business in return for the encouragement given.

No one ever made a success or got anywhere that went at a job in a half-hearted, pessimistic way. The fellow who undertakes a thing with the conviction that he is bound to succeed and continue his work with that assurance constantly in mind is the winner nine times out of ten.

Enthusiasm can be reflected by the salesman to his trade and the sales of a product materially increased if that enthusiasm is properly aroused. Better change your account in a town where you have a customer that your enthusiasm can not wake up. It's a serum you must carry on your person in quantities and inject on every occasion.

Fall in love with your goods and cause every one else to do so.

Most of the best students of salesmanship believe that a salesman transmits to his prospective customer, intuitively, his state of mind, and that a buyer to a great extent is influenced by the amount of honest enthusiasm expressed by the salesman.

There is little hope for a man to make good in any vocation unless he makes up his mind to do so and necessity requires it.

Let the salesman look into the future, to a time when he realizes that his time has been wasted; that he has not taken advantage of his opportunities; made a study of his business; increased his efficiency; become a failure and has to start all over. The right man will work hard to avoid such a climax.

In general there is too great a tendency to become what is termed—tonnage salesmen—that is, a disregard for price and credit compared with quantity.

Sales are made in three steps, so to speak. First, the attention and interest of the buyer must be secured, therefore the salesman must never try to do this if the buyer is too busy to give him his entire attention, or if he is apparently in a bad frame of mind. The approach or opening of negotiations is of the first importance.

Some salesmen, in order to size up their prospect and secure a proper opening, go so far as to learn from the hotel clerk something of local importance and incidentally mention it and get an expression on the subject from their prospect while they are getting acquainted, and preventing, if possible, cold business formality.

Second, to create a desire on the part of the buyer for the goods and for him to become one of the commercial family the salesman is working to establish. Here is where the advertising done for your trade, the assistance given the customer in securing contracts or increasing his sales, and the satisfaction the article you sell gives the trade can be impressed. There are always numerous sales arguments to use with any line.

Third, after getting the attention of the buyer, arousing his interest, and creating a desire, the conclusion of the sale is necessary, and it is at this point where most salesmen fall down.

There is a crucial point, says one of the best authorities on sales, where it is opportune to close the deal or conclude the sale, and that point is just before the buyer starts to lose interest and get other things on his mind and just after he has reached the point where he is interested in your proposition.

Before that point is reached it is too soon, after that point is passed it is too late.

After concluding the business, leave promptly, but not so abruptly as would indicate that the salesman cannot give the customer all the time he desires. Just consider that the buyer has other matters to attend to and appreciate the time he has already given to you.

Some salesmen tire out their prospect by repetition and useless talk, and neglect in approaching to let the buyer understand that they will only take the least possible time and then keep their word in this respect.

Show interest in the buyer's suggestions and comments, for from these you can either gather some valuable hints or obtain suggestions worth writing to your sales manager for the betterment of your sales organization.

Many salesmen neglect to do this and work under the impression that a sales manager needs no suggestions, while in reality the sales manager, who is progressive, lets his salesmen know that his job is to counsel and help, and that any suggestions sent in by his men are more than welcome, and while few may be adopted all will have careful consideration.

Sales managers should call periodical meetings of salesmen; appoint one of them chairman of the meeting; have experiences discussed; papers on various instructive sales subjects read; and generally work for the betterment of their organization.

MEDUSA WATERPROOFING PASTE

The Sandusky Portland Cement Company, Sandusky, Ohio, announce that they have commenced to manufacture Medusa waterproofing in paste form to meet a growing demand and preference among architects and cement users, for a waterproofing which can be dissolved in the water to be used in mixing mortar or concrete.

The Medusa Waterproofing paste is identical with the powder in resulting composition and waterproofing effect. The sole difference between the two is the greater ease and convenience of mixing which the paste form offers. In consequence of this, perfect waterproofing effect is more certainly obtained with the paste than with the powder, although if the mixing of the powder with the cement is thoroughly and carefully done, equally good results can be obtained with either form.

The Medusa Waterproofing is manufactured for this company by the Medusa Concrete Waterproofing Company, assignee and owner of the following patents:

Newberry, No. 851247, April 23, 1907.

Barrett, No. 898547, September 15, 1908.

Liebold, No. 771080, September 27, 1904.

Liebold, Reissue No. 12470, April 23, 1906.

Liebold, No. 847015, March 12, 1907.

By the decrees of the U. S. District Court, Northern District of Illinois, February 13, 1914, and of the U. S. Circuit Court of Appeals for the Seventh Circuit, January 4, 1915, the Newberry patent was fully sustained and the product of a well-known maker of waterproofing declared an infringement. The decree of the Court of Appeals gives so broad an interpretation of the claims of the patent that all waterproofing materials for concrete, of a water-repellant nature, unless made under legal license, will probably be adjudged to be infringements. Suits against several makers of waterproofing compounds are pending. A copy of the above decree will be sent on application.

Medusa Waterproofing Paste is shipped in square cans, with large friction seal, of 1 gallon (8 lbs.) and 5 gallons (40 lbs.) each. These are packed for shipment in substantial crates of 6 one-gallon or 2 five-gallon cans each.

The price of Medusa Waterproofing Paste is substantially the same as that of the powder. It contains, also, the same percentage of combined fatty acids and is therefore equal to the powder in waterproofing effect. Prices, delivered at any freight or express station in the United States, quoted on application.

The Medusa Waterproofing Paste is to be dissolved in the water with which concrete or mortar is to be mixed. To obtain easy solution, use soft and slightly warm water. Hard water tends to precipitate the paste in a curdy form; however, the addition of a slightly increased quantity of the paste will overcome this trouble. Cold water, below 60 degrees F., also dissolves the paste with difficulty.

To save time and labor in dissolving, empty the paste from the can into a pail or tub, add an equal volume of water, and stir thoroughly until a smooth cream is formed; then add this mixture to the balance of the water to be used.

A barrel of Portland cement requires about 20 gallons of water to make 1:2 mortar or 1:2:4 concrete. For best waterproof qualities, 1 gallon of Waterproofing Paste, or 8 lbs., should be used to each barrel of cement. One gallon of paste is therefore to be dissolved in approximately 20 gallons of water, this volume of water to be varied as found necessary to give a soft plastic concrete which may easily be made to flow into all parts of the forms by slight spading, without ramming.

A cubic yard of concrete, 1:2:4, requires $1\frac{1}{2}$ barrels of cement, and will therefore need approximately 30 gallons of water and $1\frac{1}{2}$ gallons, or 12 lbs. of waterproofing paste, for best results. This corresponds to 2 per cent. of the weight of cement used, which is always recommended. It is however understood that when extreme resistance to water is not essential, or in the case of large masses of solid concrete, the amount of waterproofing paste may be reduced to $1\frac{1}{2}$ per cent., or even to 1 per cent. of the weight of cement used. Further information will be gladly furnished on application to Sandusky Portland Cement Co., Sandusky, Ohio, by mentioning Cement and Engineering News.

PROTECTING CONCRETE CURB CORNERS

The necessity of protecting the exposed corners of concrete masses, such as street curbs and various forms of concrete, has long been recognized by engi-

neers and experts, and several methods of affording this protection from external injury have been tried.

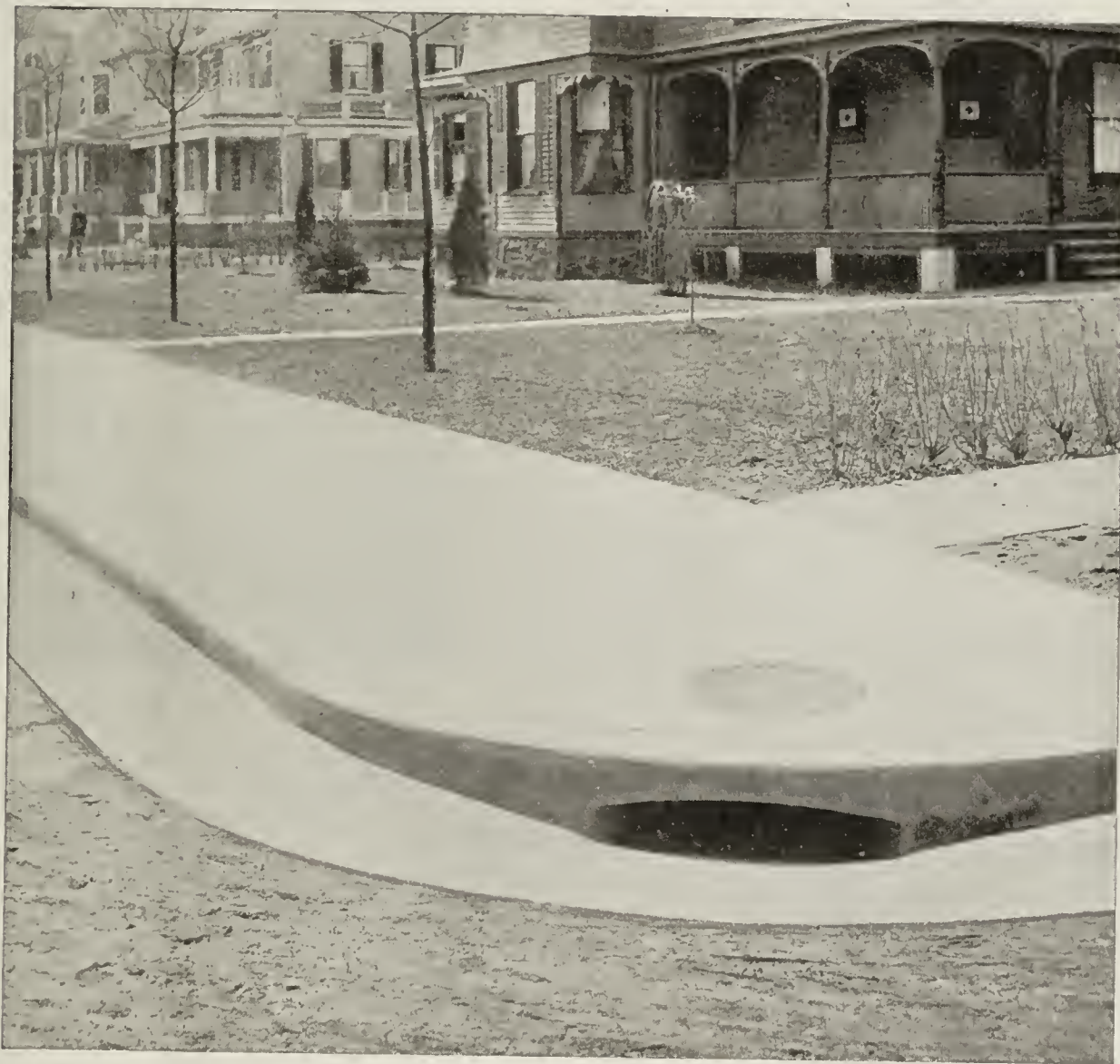
The use of an angle iron on the corner of a concrete street curb is a natural conception, but a light angle iron cannot be made to stay in place, and a heavy angle iron more than doubles the cost of the curbing. Flat plates have frequently been bolted to the corners of concrete curbs or other concrete shapes, but have been found to be too expensive. The use of a round iron rod or of a hollow iron pipe filled with concrete has also been tried.

Protecting Concrete Corners

In 1889 H. H. Wainwright first devised a permanent and practical means of protecting the corners of street curbs. In a few years the question of concrete protection resolved itself into the simple proposition, namely, that the purpose for which this protection was required could best be accomplished by the use of a soft steel rounded head T bar, with a dovetailed web projecting into the concrete. Upon the dovetailed web

largely depends the success of this bar. Its solid rounded head, and the shape of the head where it joins the concrete permit a proper finish of the latter. The bar is galvanized to prevent rusting.

The cut shown here represents a section of this bar. When the bar is properly set in the concrete, it is self-anchored, and the concrete finishes at the external surface of the bar not in a thin web, but in a body sufficiently heavy to avoid splitting away from the metal. After the bar has been in place a short time, it takes on an appearance so like the concrete that there is no staining of the cement surface. All of these features, including the galvanizing of the bar, its general shape and the integral dovetailed anchorage, have been covered by patents issued to H. H. Wainwright, and now owned by the Steel Protected Concrete Company, Real Estate Trust Bldg., Philadelphia, Pa. Printed directions for the use of this corner bar and the construction of concrete curbs and gutters will



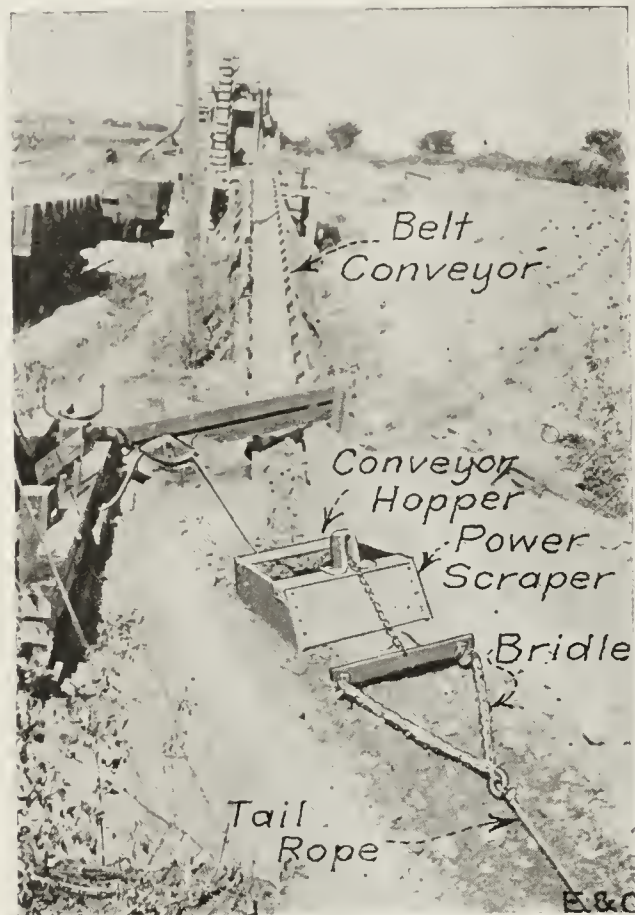
The result of this policy has been the use of over 8,000,000 feet of these bars within the last few years in the United States, and the Wainwright system of curbing is now laid in over 500 different cities, some of which are using this curb to the exclusion of all others. It is claimed to be not only the cheapest durable street curbing that can be made, but its ornamental features also appeal to people interested in curbing.

The Steel Protected Concrete Company has given its exclusive attention to the question of steel-bound concrete curbing for twenty years, and in the light of this experience its contention that the Wainwright galvanized steel corner bar is an ideal means of protecting the exposed edges of concrete, and is particularly adapted to street curbing, carries weight. The steel bar is also largely used for the protection of the corners of steps, sills, columns and other exposed concrete edges.

SAND AND GRAVEL PLANT IN OTTAWA, ILL.

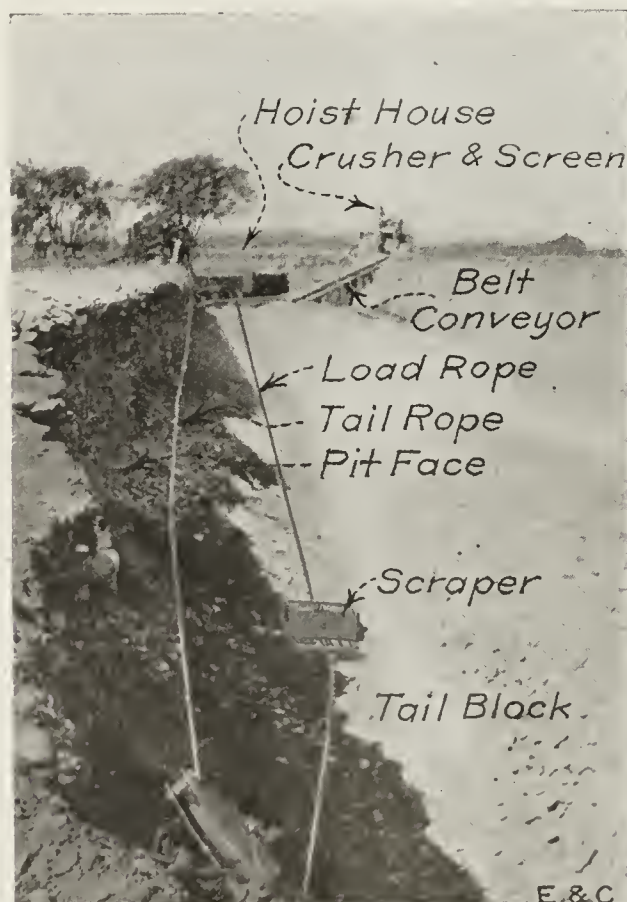
The illustrations on this page show an economical method of excavating packed gravel without the use of an expensive equipment.

This plant is owned and operated by Patrick Clark at Ottawa, Ill., and it consists of a half cubic yard Sauerman drag line cableway excavator operated by a 50 h.p. electric hoist; a belt conveyor for delivering to



the crusher; a crushing and scraping plant; and storage bins from which material is emptied into railroad cars.

The operating method of this plant is as follows: By means of the tail or pull-back rope which is worked



by one of the hoist drums, the bucket is carried into the pit. The load rope operated by the other drum draws in the bucket causing it to pick up its load. At the conveyor the load is dropped on the belt, the scraper being of the bottomless type. The tail rope is then tightened and the process repeated.

When a change in the working location is desired,

the position of the guide block through which the tail rope runs is shifted.

The pull back line on this plant is a 1/2-inch Leschen Cast Steel Wire Rope, and the load line is a 3/4-inch Hercules Wire Rope. The scraper is substantially reinforced throughout and in case of hard digging the cutter edge can be equipped with teeth.

NEW PUBLICITY MANAGER FOR UNIVERSAL CEMENT COMPANY

Announcement has been made of the resignation of J. P. Beck as publicity manager of the Universal Portland Cement Co., of Chicago. He will be succeeded



Robert F. Hall.

by Robert F. Hall, who for several years has been connected with the sales department of the Universal company. Mr. Beck has been with the company for eight years. No statement of his future plans has been made public.

CHAIN BELT CONCRETE MACHINERY

The Chain Belt Co. of Milwaukee, Wis., operating for twenty-five years, and who are manufacturing concrete mixers for eight years, describe in detail in their Catalog No. 60 all parts of their well-known concrete mixer, illustrating the manufacture of the various



parts, the mounting and operation of the complete machine and its working on the job.

Every contractor should send for the catalog, as it contains much valuable information.

Among The Cement Mills

DEALERS' PROFITS

By Edward M. Hagar*

There is no more vital and pressing problem confronting the manufacturers of Portland cement in this country than the profits the dealers derive from their sales of this commodity, and I appear before you in the hope that a frank discussion of the subject may lead, through your co-operation, to the use of such methods as will be fair and satisfactory to all parties concerned—the manufacturer, the dealer, the contractor, or consumer.

It must be admitted that the manufacturers have too long been content to merely furnish dealers the cement required in their business, and so long as the dealer was more or less regular in placing his orders for cement and prompt about paying his bills, the manufacturer has worried very little about the dealer's prosperity, and has not concerned himself with the profit the dealer realizes from the cement end of his business.

It is now recognized by many that the margin of profit today in the handling of Portland cement by the majority of the dealers in this country is not sufficient to induce the dealer to go out of his way to increase the volume of his business by increasing the consumption of cement in his locality. We are advised by some dealers that they keep cement in stock for the same reason that a grocer keeps sugar—he does not care whether his customers demand much or little sugar, since the profit adds so little to his net returns. A gross profit to the dealer of 5 cents a barrel for handling cement is, in the majority of cases, too small to return more than a new dollar for an old one.

During the last six months these facts have become evident as never before, and have developed, in my opinion, for two reasons:

First. The better and more businesslike practice of eliminating speculative purchases by the dealer, and the substitution of purchases for current shipments for the general trade, or by contracts between the manufacturer and the dealer to cover specified work actually secured by the contractor.

Second. For the first time in fifteen years the price of Portland cement in 1913 remained fairly stationary throughout the year. Whereas, in the olden days we had several years in which the mill price for Portland cement varied as much as \$1.00 a barrel within twelve months, last year the average variation from high to low price was probably nearer 10 cents a barrel.

Both of these evidences of the more mature and steady industry have called attention to the fact that in the past dealers have relied more upon their keen sense of prognosticating the future course of the cement market to obtain their profits than upon their ability as merchants to secure a proper margin, by making their retail price at a fair advance over the wholesale price at any given time.

As the Portland cement industry grows in size and years this tendency toward saner methods and steadier prices will proceed, and there is little likelihood of again seeing such wide variations as were encountered during the babyhood of the industry. This means that the dealers must look, as any other retail merchant, to the merchandising profit only, and not depend at all on trying to guess the course of prices.

It is being brought out by the more efficient accounting and bookkeeping methods now being applied to their business by the dealers generally that this feature has not received proper consideration.

You may ask why a large manufacturer of Portland cement, having no direct financial interest or ownership in the business of any dealer, should come before you and presume to discuss a matter apparently outside of his province, but I consider the present situation—the growing dissatisfaction among the dealers at their own returns from handling Portland cement—a grave menace to the growth of the cement industry, and, therefore, to the prosperity of the manufacturer, and I so stated at a meeting of the Association of Portland Cement Manufacturers held in Detroit in September, 1913.

I believe that cement manufacturers individually should do all in their power, both by their own actions, and by consultation, each with their own dealers, who in reality constitute their agents, to insure that these dealers have sufficient pecuniary return in acting in their indispensable capacity as intermediaries, to make it to the interest of such dealers, so far as lies within their power, to increase the consumption, so that they may handle two barrels where they now handle one. We cannot expect the dealers to work to increase their own, and therefore the manufacturers' business, if it has no financial interest for them.

The Association of American Portland Cement Manufacturers and some of the larger individual manufacturers are doing a great deal of work and spending large amounts of money in the effort to increase the consumption of Portland cement by education, promotion, and publicity. This work takes a number of forms, such as literature, lectures, information bureaus, exhibitions, etc. A good deal of this work is wasted—the cement dealer in each community, no matter how small, is not anxious, or even willing, in the great majority of cases, to assist in this work among his neighbors and customers by the proper use of this educational material.

I hope you are convinced that the prosperity of the cement manufacturer is largely tied up in the prosperity of the cement dealer, and that he desires, as much as you, that you may sell a large volume of cement at a good profit. It is for your benefit, as well as for that of the manufacturer, to look at this matter in a broad way, and there is much to be gained by treating the manufacturer as your friend, as you certainly are his friend.

The manufacturer and dealer are equally indispensable to each other, and with a greater recognition of the mutuality of their interests, both will profit in a marked degree.

As to the cure for the difficulty, I do not know of any simple solution that would fit all cases, or any rules that would not be wrong or unfair in their application to more cases than such cases would fit, as the conditions of the problem are so different in large cities from small cities, and in small cities from country towns. Again, two communities of the same size may present a number of reasons, some of them even topographical, for different treatment. There is no such thing as a proper margin expressed in cents per barrel. A profit per barrel that would be correct in one community for a good-sized sale would be too great in other cases, and too small in still others. I am sure 5 cents a barrel profit is too small in almost all cases; 25 cents a barrel is too small for some sales in certain

*President of the Universal Portland Cement Co. Paper delivered before the National Builders' Supply Association.

locations, and yet much too great for a number of cases that arise in the regular business of the cement dealers.

In spite of these difficulties, there are certain principles that can be enunciated; the simplest one is that manufacturers should so conduct their business, and dealers so conduct their affairs, that the dealer is permitted to and does obtain a proper return for his investment, his work, his credit risks, and the services he renders his customer and the community at large. To work out the proper details so that this principle means anything but a platitude may take time and patience. We have taken one step toward the happy solution when we realize that the present methods are far from perfect and are injurious to both dealer and manufacturer.

The blame for the present unsatisfactory conditions rests on both the manufacturer and the dealer, and neither party to this discussion can solve the problem by himself. There is no way, either effectively or legally, that the manufacturer can compel his dealer to demand and receive a fair margin over the price paid the manufacturer, even though he may do nothing to prevent the dealer from obtaining a fair and reasonable margin. The fault lies with both, and the correction of it lies with both.

Quite recently some of the manufacturers have endeavored to at least afford some relief to the situation (although this cannot be considered a cure) by the experiment or temporary expedient of quoting all contractors and consumers, irrespective of the size of the contract, a price at least 5 cents higher delivered at the same point for the same time of delivery than would be quoted a dealer, and besides this have increased the cash discount for payment in ten days from 1 cent to 2 cents per barrel. This permits a difference of at least 7 cents a barrel between the manufacturer's price to the contractor or consumer above that to the dealer, as the dealers generally are in position to discount their bills and the contractors generally are not. This is not, however, in most cases a sufficient margin, and the very attempt on the part of the manufacturer to protect his dealer in a good many cases tends to limiting the margin of profit to the amount of protection, and to a certain extent defeats its own object.

Again, it is found that in a number of cases the dealer will not add the full 5 cents to his cost price. If a 10-cent differential should be adopted by the manufacturer so as to permit the dealer to make that much gross margin outside of the discount, the dealer on his part would not avail himself of this margin.

Unfortunately, it frequently occurs that a dealer is willing to ask practically no margin on cement in order to secure business for the other commodities which he handles for a particular piece of work, and thus injures himself by reducing the margin possible to obtain for cement in other cases. It is just as bad practice and reacts as much on the dealer to sell cement at a loss or without profit, in order to secure business for other wares which he handles, as to ask a high and prohibitive margin.

Speculation in cement by the dealer, by which he might make considerable profit if the market advances (as he hoped), but might be ruined if it declines, has been largely eliminated by the modern method of selling the dealer for his warehouse trade for shipment within thirty days only, and contracting with him for shipment later than thirty days for specified amounts to cover specific work only, for which he, in turn, has contracted with the contractor or consumer; but there still remains a practice, alike inimical to the interests of the manufacturer and the dealer, and that is so-called "padding" of specific work con-

tracts, the contracts with the manufacturer by the dealer being made for a larger amount than the work calls for; if the market goes up, the difference in quantity is taken into stock by the dealer and rarely, if ever, sold at a price based on the current market price, thus reducing the margin on this dealer's spot business and making it almost impossible for other dealers in that town, who have been more conscientious in their contracting methods, from making any margin whatever in competition with the padding in the specific contract made at a lower figure than the new market value. If the market declines prior to the completion of the padded contract, the manufacturer is advised that the work did not require as much as the contractor estimated. This, as well as any other practice that is not fair, honest, and in accordance with the principle of "A contract is a contract" is injurious to the dealer as well as to the manufacturer.

A great deal of money has been lost, or at least failed to be made, by indulgence in local feuds with brother dealers in the same community, and in an always reprehensible and generally useless effort to eliminate certain competition. Modern ethics require competition, but not destruction. The absence of one is as much to be deplored as the presence of the other.

Cement being a heavy commodity of low value per pound, the selling price being less for the same weight than ordinary hard coal, it follows that any expense connected with handling it from the cars to the warehouse, from the warehouse to the team, by team to the job—any one of these items or the aggregate is a disproportionately high percentage of the selling price compared to commodities of greater value per unit of weight. This is a factor that is generally not sufficiently considered.

Entirely aside from the interest and depreciation on the investment in land, buildings and warehouses, and in addition overhead expenses and return on working capital, it requires a number of cents per barrel profit to take care of the cost of carrying accounts of the dealer's customers, and, where necessary, of collecting, counting, shipping, and paying freight on returned sacks.

It is hardly necessary for me to state that many of these items of expense apply to carload business as well as to cases where the cement must be put through the warehouse or teamed to the job. The difference in cents per barrel asked by some dealers for delivery by team compared to the price which they pay the manufacturer f. o. b. cars at their warehouse is so ridiculously low that it can mean nothing but a loss on each barrel sold.

The time allotted to me will not permit my dwelling upon a number of factors that have a bearing, either directly or indirectly, on dealers' profits, some of which are worthy of a separate paper, such as dangerous granting of credits, economical warehouse facilities, businesslike methods in insisting upon written agreements with contractors as clear, concise and binding as between the dealer and the manufacturer covering the same transaction, a strict compliance with the principle "A contract is a contract," both in dealings with the manufacturer and the customer; making quotations with definite dates of expiration to afford protection against advance of the market before decision is reached; even the carrying of proper stocks, and the giving of sufficient notice in advance of shipments required so as to avoid the expensive experience of having no cement on hand to meet the obligations of contracts or daily demand.

More important than any other one feature, outside of gross margin per barrel and volume of business, is that of proper handling of cloth sacks. As careless methods in this respect will easily turn a fair profit

into an actual loss in the handling of a given quantity of cement at the same margin, I shall touch on this subject in a cursory manner.

Cement sacks can hardly be considered a source of revenue to the dealer, but they must not be overlooked in any consideration of the items that affect his profits. Unfortunately, cement sacks have generally been a source of loss and expense. The dealer may not be altogether to blame for this regrettable condition, but here, as in many other cases, his salvation lies entirely within his own hands.

The root of all our sack troubles has been the old superstition that, through some strange dispensation of Providence, the cloth cement sack was a free package. It cannot be a free package any more than can a paper cement bag, or a baking powder can, or a biscuit box, because ultimately someone has to pay for it. There are three classes of people who might be called upon to pay for cement sacks—that is to say, the cement manufacturer, the dealer, or the customer. For the purpose of the present argument we will eliminate the dealer, because I am sure that the dealer does not want to pay for these packages, and I am equally sure that no fair-minded cement manufacturer desires him to do so. The question to be settled, therefore, is whether the manufacturer or the customer shall carry this load.

There is nothing but established custom to prevent manufacturers of cement from selling their product in non-returnable packages in the same way as is done by manufacturers of canned goods and many other commodities. In fact, we do sell a large part of our product in paper bags which are non-returnable. In determining the price to be charged for cement we add to our net price $2\frac{1}{2}$ cents a bag, or 10 cents a barrel, for these paper bags. The customer buys the bags, and when he has emptied them he burns them up, or throws them away, or makes any other disposition of them that he sees fit. He has paid 10 cents a barrel for the package in which he received his cement. When we sell cement in cloth we add to the net price of the cement 10 cents a sack, or 40 cents a barrel, for the packages, but agree with the customer to buy back from him any of the packages that are in fit condition for further service at the same price of 10 cents which we have charged him for them. This means that if the customer takes good care of his sacks, and does not allow them to be destroyed or stolen, all he will have to pay for the cement packages will be the cost of handling and shipping the sacks, plus the value of the relatively small number which may die on his hands through natural wear and tear. If a man handles his sacks in this way, his package expense will be small. If he is careless with them and allows them to be lost or destroyed, his package expense will be heavy, very heavy, but you will note that this additional load will fall exactly where it belongs.

Now, supposing that the cement manufacturers should do as many of their customers would undoubtedly like to have them, and agree to buy back worthless sacks, or even agree not to make any charge for the sacks in the first place, but only to accept with gratitude such sacks as the customer saw fit to return. A policy of this kind would have two results. In the first place, it would add to the cement manufacturer's cost of making and selling his product another great, big item of expense for sack losses. In the second place, this expense would get larger every year, because there would be no inducement for anyone to go to the expense of taking care of his sacks, and presently cloth sacks would be making only one trip

in the same way that paper bags now do. With this large and constantly growing expense on his shoulders the cement manufacturer would have to get more money for his cement. He would have to spread this additional cost over all his customers, regardless of whether the individual took good care of his sacks or not. In other words, the competent and efficient customer would be assessed a part of the loss which originated with the incompetent and inefficient user, and the result would be to put a premium on carelessness and a penalty on carefulness.

The cement manufacturer, like any other manufacturer who desires to remain solvent, must get back from his customers the complete cost of his product, plus a fair profit. If to the cost of our product must be added a big package loss we must get that back from our customers. Now, isn't it fairer to get that package loss back from the customers who are responsible for the loss, instead of spreading it over the innocent and guilty alike? You can see that no matter how things are arranged on the surface, the consumer of the cement must pay for the package, so the only problem to solve is the one of putting that loss where it fairly belongs. These ideas on the subject of sacks may never have been presented to you in just this way before, and it may strike you that my presentation of them has been, to say the least, straightforward, if not forcible. I want to drive these points home, because if the cloth cement sack is ever to be anything but a source of trouble and loss to you, you must drive them home with your customers. You must make your customers understand that cement sacks are not loaned or donated to them, but the privilege of receiving their cement in returnable sacks is a privilege, and one which they must not abuse. You must make them understand that cement manufacturers have no object in buying sacks unless they can use those sacks again, so that you, in turn, are not justified in buying from your customers sacks which you cannot sell to the cement manufacturers. You must make your customers understand that the money which they lose on a few sacks is the package charge on all the cement they have handled, and you must make them understand and appreciate that even if they have to pay for a few worn-out sacks, to say nothing of the sacks which are prematurely destroyed through their own misuse or neglect, they are still getting their cement in a cheaper and more economical package than any non-returnable package could possibly be.

This is going to be a difficult doctrine to preach, and it is going to require a lot of hard and thankless work, but if the sack end of the cement business is ever going to be anything except a source of friction and disputes, as well as loss to you, this work must be done, and the sooner it is started the sooner will this package loss cease to be a charge against your profits. We have done a great deal to help the dealer in this educational work, but we want to do more. In this respect, as otherwise, the dealers' interests are ours, and incidentally in the long run the ultimate best interests of your customers, the consumers, will be served by a clear and proper understanding of this package question.

Cement manufacturers are doing wonderful work to increase the use of cement for the classes of work which have existed for some time, as well as in finding and exploiting new uses. The steady increase in cement consumption in this country, in spite of the depressions that have affected practically every other industry, would not, in my opinion, have occurred had it not been for this educational work. The thousands

of cement dealers in this country are in position to render great assistance to this end, and thereby improve their own financial welfare. Broad-minded manufacturers realize that their services must be enlisted, and that the desired enthusiasm must come as a result of benefit to their pocketbooks.

With the large amount of powerful ammunition that will be freely supplied to the dealer by the manufacturer in the shape of booklets and educational information to suit both the large and small items of cement uses in the innumerable directions in which cement is and should be used, the local dealer, with comparatively small effort, will find it easy to increase the consumption in his locality, and by so doing augment the number of units on which he will receive a certain gross profit, which will enhance the net profits in greater proportion than the increased volume of his cement trade. The greater the volume, the smaller is the necessary margin of gross profit, and the larger the volume, the greater the percentage of gross profits that may be converted into net profit.

We generally find that the dealer is not taking enough interest to educate himself sufficiently to discuss the use of cement with a prospective customer. This education is available in literature that costs him nothing.

In conclusion, the success of the cement dealer and the manufacturer largely depends upon each other, and a mutually friendly, honest feeling should exist, with a willingness on the part of both to co-operate with a real interest in each other's success.

You will find that the right-minded and broad-minded manufacturer is ready to assist by all means in his power to bring about the desired results. If each dealer will approach this subject with the manufacturer or manufacturers from whom he secures his supplies in a spirit of co-operation and confidence, I believe it will soon remove this question, at present so vexatious.

FORT DODGE CEMENT CO.

The annual meeting of the stockholders of the Fort Dodge Portland Cement corporation was recently held in Ft. Dodge, Iowa.

The following officers and directors were elected for the year 1915:

M. J. Nicholson, president; L. H. Van Alstine, vice-president; H. S. Van Alstine, secy.-treasurer; T. A. Mair, general manager.

After having labored for several years to build the plant at Gilmore City, the officers and stockholders are beginning to see an end to their labors. It is expected the plant will be completed by next August. When it is finished about \$650,000 will have been expended. It will have a daily capacity of 1,500 barrels of cement.

Practically all of the buildings have been completed except the clinker-bin for the storage of materials, after they have been burned in the kilns, grinding mill buildings and the stock-bin for the storage of the finished product. These buildings they hope to have completed during the early part of the summer. The power house has been enlarged to accommodate three new boilers and a big Corliss engine. The power house when completed will furnish 1,200 horse power. The rock crushing business for the past three years has been very successful.

During the season just passed the company has sold over 800 carloads of crushed rock. This trade is rapidly increasing. Several hundred cars during the year were shipped to Des Moines, Indianola, Omaha and many other towns which recognize the excellent quality of the Gilmore City product. The outlook for 1915 in crushed rock looks encouraging, as the company has already booked several large orders.

HANDLING PULVERIZED COAL

There have only been a few explosions in cement plants from coal dust, and only one disastrous one, which I recall, which occurred some years ago, writes Paul C. Van Zandt.

The only rules that I know regarding the prevention of explosions are:

Do not store pulverized coal for any length of time, and be very careful in drawing from a bin pulverized coal that has been stored, as the coal dust under pressure and the accumulation of moisture standing any length of time begin to heat up to the explosive temperature. This will not explode while standing because of the absence of air. In starting to draw the coal from the bin, the air gets to the heated coal, which explodes, firing the balance.

I never knew of coal dust exploding in any other way in a cement plant, although I confess I would not care to try the experiment of running a sparking motor or pulling a knife switch in a coal-grinding mill.

BAG SPLITTER MEASURES CEMENT IN LESS THAN BAG BATCHES

A device for measuring one-half a sack of cement, perfected by W. J. Cullen (30 Church street), New York representative of the T. L. Smith Company, Milwaukee, was exhibited by that company for the first time at the recent Chicago Cement Show. The Cullen bag splitter, as it is called, consists of a galvanized iron pail 12 inches in diameter and 18 inches high, with a circular damper in about the center of the pail. By means of the bucket handle the damper can be raised or lowered. In measuring cement the damper is put in a vertical position and the entire bag dumped into the pail. Then the handle is raised from its normal to carrying position and the upper half dumped, then the handle turned through a quarter turn and the rest dumped.

SANDUSKY CEMENT CO.

A record shipping from one point in one day was established by the Sandusky Portland Cement Company at its Dixon, Ill., plant. Sixty carloads of cement were shipped to distributing agents in Wisconsin and Minnesota. It was by far the largest one day's shipment from one plant in the history of the company.

In the sixty cars were 11,000 barrels of cement, weighing, all told, about 2,200 tons. The shipment filled a train almost half a mile long. The reason for the large one day's shipment was that the freight rates increased eight cents per barrel on Monday.

The making of record breaking shipments this early in the season is an encouraging business sign. Officials look for the most prosperous year in the history of the company.

GIANT BLAST AT QUARRY REQUIRED SIX MONTHS' PREPARATION

The face of a limestone quarry near Riverside, Cal., owned by the Riverside Portland Cement Company, was recently broken up for convenient handling in a single gigantic blast that utilized 60 tons of Du Pont explosives and moved between 125,000 and 135,000 tons of rock. During the past 6 months a crew of men have been constructing, behind the face of the quarry, a T-shaped tunnel 500 ft. long in which to place the powder charges. For two weeks prior to the blast twenty men were engaged in loading eleven wells spaced at intervals along the tunnel line. The effect of the explosion, it is reported, was to shatter a section of the face of the quarry 160 ft. high and 900 ft. long, which will supply the cement plant with enough limestone to last nearly a year.

CONCRETE BURIAL VAULT INDUSTRY

The use of concrete burial vaults during the last few years has increased at an astonishing rate, reflecting a demand caused in part by the general development of the concrete industry—a demand for concrete products of all kinds. Then there has never been a period during which the undertaking profession has made so great progress in all departments as in the last ten years; consequently a much higher grade of funeral furnishings of all kinds are being used now than ever before, and therefore there has been an increased demand for a higher state of perfection in burial vaults. Then again, the public in general are being educated out of the old-time method of burying with only an ordinary wooden box to protect the remains; and along with this education has come a spirit of investigation as to what kind of burial vault is best, the result of all this being that the concrete vault is more in demand than any other.

The Automatic Sealing Vault Co., 203 East River street, Peru, Indiana, has not been slow in realizing the truth of the above statements, and has spared neither time nor money in bringing the automatic sealing vault up to the highest standard of perfection.

At the time this vault was invented, there were a number of two-piece concrete vaults, besides several sectional vaults, on the market; but all belonged

LUNKENHEIMER EXHIBIT AT THE SAN DIEGO EXPOSITION

This exhibit fully substantiates the claim of the Lunkenheimer Company of being the largest manufacturers of high grade engineering specialties in the world.

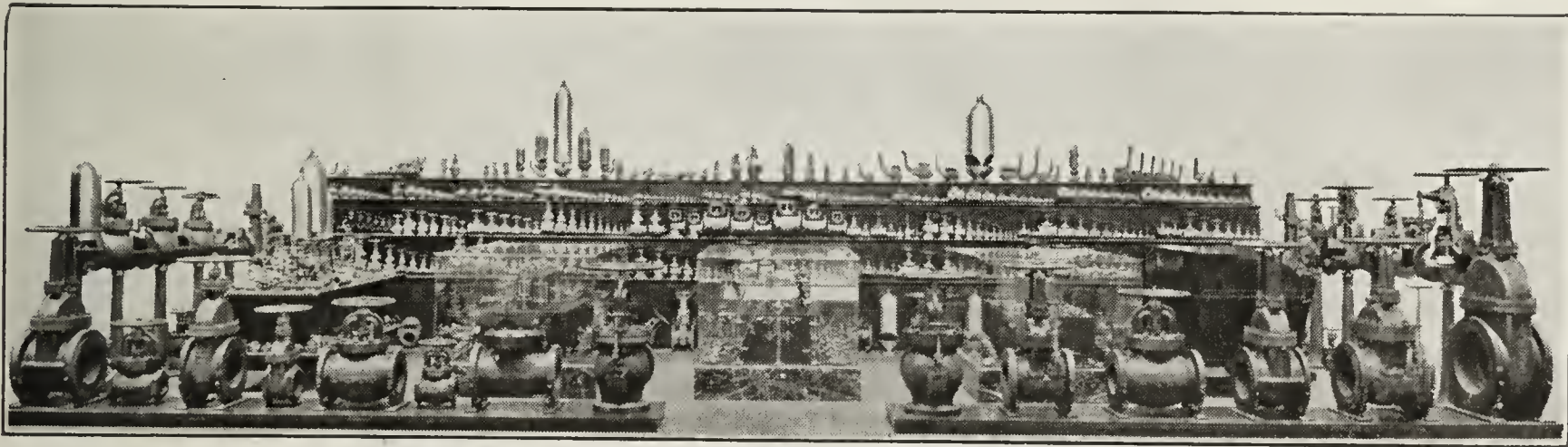
In great variety are displayed bronze, iron, "puddled" semi-steel and cast steel globe, angle, cross, check, gate, non-return boiler stop and throttle valves; also bronze and iron, pop safety, relief and blow-off valves; water columns and gauges; whistles, ground key work, injectors and ejectors; bronze fittings and unions; cylinder lubricators, oiling devices, oil and grease cups; automobile and motor boat specialties, etc.

The display is exceptionally attractive, its neatness adding materially to its appearance.

Strength, durability and expert workmanship are at once apparent upon the examination of any of the articles shown.

Information regarding the products is cheerfully given by the attendants.

The executive offices and factories of the Lunkenheimer Company are located in Cincinnati, Ohio. Branches and selling agencies are maintained everywhere.



Lunkenheimer Exhibit at San Diego.

practically to the same class, as they all depended on having their different sections cemented together in order to make them water-tight—a process which is of doubtful efficacy for the simple reason that the chemical action which hardens a mass of concrete by causing the elements of which it is composed to crystallize is exhausted in the process; and any attempt to unite two or more sections of seasoned concrete with fresh cement simply results in a chemical action taking place in the fresh cement only, causing it to crystallize, but the sections are not united as there is no affinity in a mass of seasoned concrete for the elements of which it was originally composed. The fresh cement may cause the sections to adhere together; but the old joint still remains, through which the water, it is claimed, will eventually filter.

PORTABILITY AND SPEED FEATURES OF NEW CAR UNLOADER

A portable car unloader designed to meet the needs of the contractor has been placed on the market. A feature of design is the ease with which it is said the machine can be "knocked down" and taken from job to job. The boom which carries the conveying elevator can be swung to a position so that the elevator gives a clearance to trains moving along the track. It is claimed that this rigging and three men can unload 50 tons per hour. The equipment also includes a 2-ton steel bin and a 4-hp. engine. The unloader, which is made in two styles, one stationary, and the other built on wheels, is manufactured by the Link Belt Company, of Chicago.

"OBSTITCH" DIAMOND REINFORCEMENT BELTING

For some time past there has been a growing demand by users of wide and heavy belts for the very best belt they can find, even though the first cost be greater.

With this incentive the Mount Vernon Belting Co., of Baltimore, Md., have devoted a great deal of time, work and study to perfect a belt that would meet every requirement in strength, adaptation and longevity, and in their "Obstitch" have accomplished this end.

The construction of the "Obstitch" with diamond reinforcement shows the best quality of material and workmanship in every part. It is made from a specially constructed cotton duck weighing 34 ounces to the square yard—weight positively guaranteed—and this extra weight, being added in the wrap threads, gives it a very high tensile strength.

It is treated by two distinctive processes, making the belt an absolute water, alkali and acid resistant. The one for general transmission and carrying purposes is finished in yellow, and the other, finished black, is treated specially for extremely hot places, such as carrying hot clinkers, clay, etc.

The "Obstitch" has been subjected to the most severe practical tests against several of the oldest and most widely known textile belts in the world, with results that it gave from 75 to 100 per cent better service than any of them.

GOODRICH COMPANY ISSUES 1915 TRUCK HANDBOOK

Cement men, engineers, and contractors are in the vanguard of American truck users. With the possible exception of brewers, building supply men and contractors constitute the first class of progressive business men to seize the advantages offered by the motor truck. In road building and general municipal work, especially, the motor truck has become indispensable. The decreasing margin of profits in municipal awards has made speed the deciding feature between gain and loss. "The man with the motor truck makes the money," is a proverb among municipal contractors.

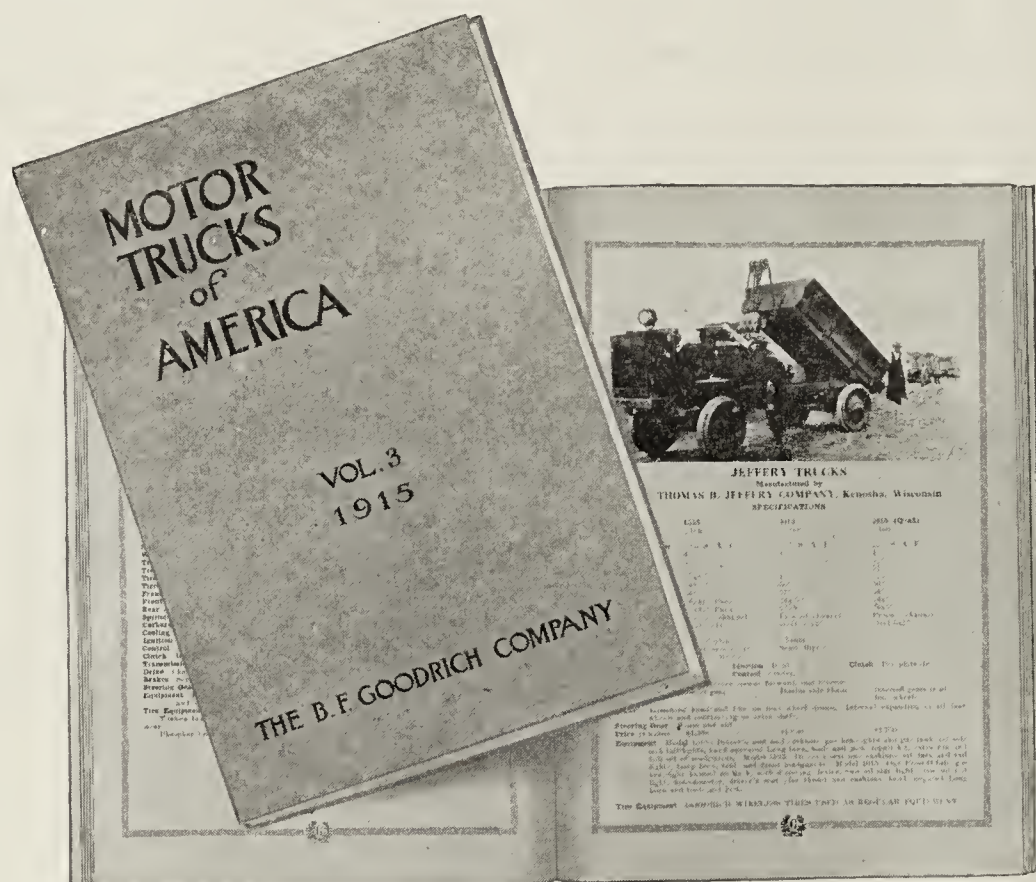
The allied fields controlled by the building material and supply men have been no less eager to motorize trade and so build business and pile up profits. 1915 will be the greatest year for the motor truck industry the country has ever seen, and all indications point to an exceptional buying activity among contractors and building supply men. With

and is now ready for distribution to contractors and building supply men who make requests on their business stationery. The quality of this work is assured to readers of Cement and Engineering News, for contractors and building supply men everywhere are acquainted with the merits of such excellent products as Goodrich wireless truck tires, Goodrich hose, Goodrich rubber footwear—everything in rubber.

CONCRETE POSTS ALONG RAILWAY LINE

About 10,000 fence-posts were made and placed last season by the San Pedro, Los Angeles & Salt Lake Railroad, which has a special plant for post manufacture near Salt Lake City. This road has already about 23 miles of fence of this kind along its right of way.

The posts are approximately rectangular in plan, but with the sides tapering slightly and the back rounded. They taper from 5x5 in. at base, to 3x3 in. at top. There are five fence wires secured to the flat side of the post by galvanized tie-wires passing around



an eye upon 1915 business, the contractor is preparing for his busy season by choosing motor trucks for the present year.

There is such a good line of power wagons at present on the market that with only the aid of catalogs and salesmen's arguments, it is hard to choose just the truck most adaptable to the purposes of the contractor or building supply man. With this in mind, the B. F. Goodrich Company, always on the lookout for co-operative aids to users or prospective users of its products, compiled Motor Trucks of America.

This valuable book, now in its third volume, is a complete summary of truck information, including illustrations and specifications of nearly a hundred leading power wagons. The acknowledged value of an authoritative book of this kind created a demand that made necessary volume III, 1915 edition. Its typographical appearance is handsome, it is durably bound, and it has been carefully edited to suit the purposes of any prospective truck buyer. It contains beside motor truck specifications and illustrations, helpful material on such subjects as "Questions Involved in Changing From Horse to Motor Delivery," "The Relation of Tires to the Cost of Maintenance of Motor Trucks," etc.

Motor Trucks of America is just off the press,

the back of the post and having their ends wrapped around the fence wires. The posts are 7½ ft. long, set 3 to 3½ ft. in the ground, and weigh 89 lbs. each. They are spaced 16 ft. apart. The cost averages a little over 21 cents each, which does not cover interest on plant, or depreciation. The investment in plant (bins, mixer, molds, etc.) is about \$1,000. Wood posts for the same work cost 14 to 21 cents. The anchor posts are 8 ft. long, 7x7 in. at both ends; the brace posts are 10 ft. long, 5x5 in. at both ends.

The concrete is a 1:6 mixture, the coarse aggregate being obtained from a gravel pit in which the proportions of sand and fine gravel make a very satisfactory combination for this purpose. The material is stored in elevated bins, with chutes to the mixer. The reinforcement consists of four strips of No. 18 hoop steel, ⅝ in. wide, the strips being 7 ft. 3 in. long; but ¾ in. twisted steel bars are used in the anchor posts and brace posts. The concrete is mixed to a creamy consistency, and poured into a set of ten metal molds mounted on a light steel frame which can be vibrated or shaken by hand. When the molds are full, the concrete is struck off to a level surface, and the frame is vibrated in a longitudinal direction, consolidating the material much more quickly than can be done by hand tamping.

The set of molds is then laid on level ground, and the concrete allowed to set for 24 hours, when the posts are removed from the molds, and stacked vertically in groups, being allowed to season for 60 days before being used. The number of men is usually three; and, with these, 160 posts per day can be made. With five men and additional molds, a larger number can be made; and the extra men can put in part of their time on other work. The W. E. Dunn Mfg. Co., 4139 Fillmore Street, Chicago, manufacture molds for making concrete posts. Write for their post mold catalog. Price of 4-mold battery, \$12.50—on 15 days' trial.

CONCRETE SILOS

In a recent issue you have an article mentioning the collapse of two silos in South Dakota. In this article you state that the owner had such confidence in concrete that he will have them rebuilt.

I do not know what silos you have reference to, but in our vicinity a man who lives in this city had two silos erected last year, and when they were being filled the first one collapsed and ruined the buildings near it. Now this man will have them rebuilt in the spring. He has confidence in concrete, but he is not paying for the rebuilding, but makes contractor who built them make good.

Now a few words for the benefit of those who "holler" when anything goes wrong with concrete.

I lay the failures of concrete absolutely to the incompetency or unscrupulousness of the contractor. There is often a job taken at such low figures that the contractor knows he cannot do it and do it right, and this I cannot call honesty. But the great trouble lies in the incompetency of the contractor or his superintendent or foreman. For a contractor or superintendent to be competent, he must in the first place understand—not merely the mixing or general hand-me-down specifications (such as are sent broadcast through the land by some manufacturers) but must know what sort of material he has on hand to work with. I have met with men who in argument say 1 to 7 is strong enough, then explain by saying that all specifications are, say, 1:2:4, or 1:3:4, or 1 to 7, and go to work and use pit sand or gravel according to those specifications; and again, as pit gravel does not all run alike, they do not make any difference in proportion, whether a load is finer or coarser. Those hand-me-down specifications say clean sharp sand, but the contractor or foreman does not know, or does not care, how much dirt there is in the sand.

Also in the mixing they often are careless. If they

have a batch mixer they may do everything all right and use good material, but I have seen them often in such a hurry that they do not give enough mixing, just a flop or two and let it go. Here is where I prefer a continuous mixer. Everything set right and all clean as it should be, the concrete gets enough mixing, for it has to go the length of the trough before it can be dumped in the forms. I also have seen the man who loads the hopper on a batch measure with the shovel. One batch he has dry material and the next he has damp, the next he has wet, still the same number of shovels go. A number of minor points come up in the handling of concrete which the contractor or his foreman does not heed sufficiently, and come under the head of incompetency.

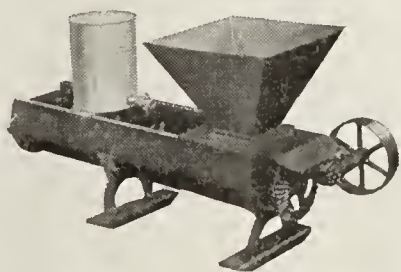
Now in this particular case—the two silos here in South Dakota—I charge the collapse to the incompetency of the man in charge of the erecting, whether it is the dirty gravel with insufficient cement, or improper curing, I would not say; but one thing is absolutely certain, he did not place the reinforcement properly, neither did he treat the joints between two days' work properly.

Critics, do not condemn concrete. Concrete is all right in competent hands. Brick buildings or stone buildings have collapsed, not because of the brick or stone, but because of incompetent hands putting them up. Respectfully, Christopher Grosse, Vermilion, S. D.—[Cement Era.]

NEBRASKA CEMENT COMPANY

James A. Gish, Jr., has become affiliated with the Nebraska Portland Cement Company, Superior, Neb., in the capacity of plant manager.

**ONLY \$26.00 FOR
X-L All Continuous
BATCH MIXER**

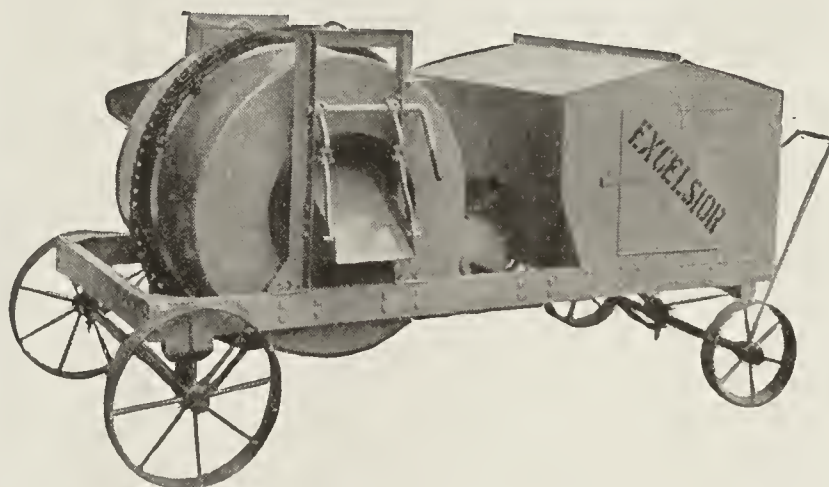


We make the largest line of small Batch and Continuous Mixers on the market. Whether you are a Cement Block, Brick, Tile Manufacturer or a Contractor, or whether you have a mixer, you should send for our literature as we make a specialty of manufacturing concrete mixers for different lines of work.

The chances are that it might pay you to discard your old mixer after you see the X-L All Special and we know it will pay you to invest in it if you have use for a concrete mixer.

**Burrell Manufacturing & Supply House
KANKAKEE, ILL.**

Compactness and Sturdiness Mean Greater Efficiency



The "Excelsior"

was designed and built to set a fast pace for the higher priced mixers and contractors say it does.

Equipped with low hopper; friction clutch; dust proof bearings; 3 H. P. engine. Can be equipped with hoist at small additional cost. Capacity $4\frac{1}{2}$ feet mixed material per batch; easily 65 cu. yds. per day.

Write for illustrated catalog and judge for yourself the extra value of the EXCELSIOR.

Good territory open for agents

Excelsior Mixer & Machinery Co.

606 Merrill Bldg.

Milwaukee, Wis.

AGENTS: Universal Steel Products Co., Chicago, Ill. L. & D. P. Smith, Valdosta, Ga. Loyal Power Co., Omaha, Neb. Manufacturers Supply Co., Minneapolis, Minn. Ward Equipment Co., Pittsburgh, Pa. E. W. Ripley, Farmington, Me.

A NEW BLASTING MACHINE

The economy of deep hole or well-drill hole blasting is responsible for its adoption by more and more cement, lime and stone quarries every year. The advantages are, economy of explosives, infrequent blasting, economy in drilling, and many other points. Deep well holes, however, have one disadvantage; they have so many dollars' worth of dynamite tied up in them that in order to insure against misfires, two or more electric blasting caps are used to prime each hole. In case the charges are broken, that is, where there is a seam of rock which offers little resistance, sand is put in that part of the hole instead of dynamite, and every broken charge requires one, and preferably two, electric blasting caps. This sometimes results in as many as four or five or more in each hole, and some of these may have wires as long as 100 feet. All this means increased electrical resistance. Power and lighting circuits are frequently used for firing these, but they have the disadvantage of having too high voltage for firing the electric blasting caps when connected in series, and not enough amperes when the electric blasting caps are connected in parallel. Parallel series connections require more care and knowledge in connecting up than is possessed by the average blaster.

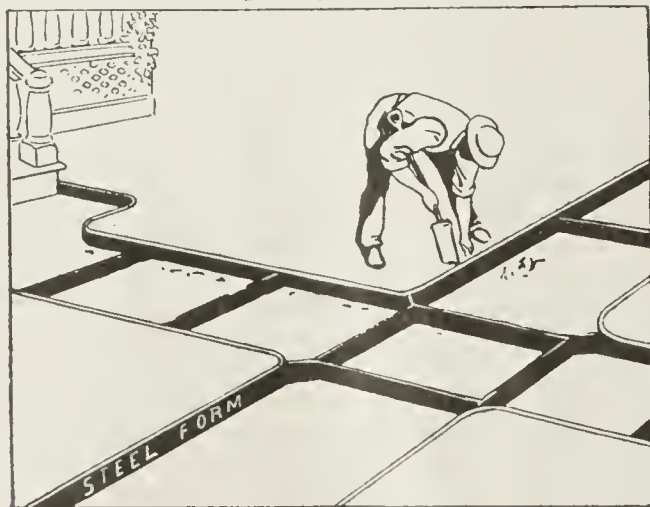
The solution of this blasting problem is the use of the Du Pont New No. 5 push-down blasting machine. This machine is a recent development and is of improved design and workmanship. It has a capacity of 100 electric blasting caps so that it can easily take care of 20 holes, each one having 5 electric blasting caps in it, all connected up in series.

The series connection is much the easiest and simplest and is the only one possible for use with the blasting machine.

The No. 5 blasting machine is a strongly built piece of apparatus in harmony with the well-drill machines, steam shovels, crushers and other sturdy machines which progressive cement, crushed stone and lime manufacturers find necessary on their plant to keep abreast of the times. Write for circulars, prices, etc. Du Pont Powder Company.

STEEL SIDEWALK FORMS

Plank for sidewalk forms is getting to be a thing of the past. And it certainly should be relegated to the junk pile, when there can be found on the market such a convenient, time-saving device as the "Heltzel" or the "Indiana" all-steel sidewalk forms, made by Indiana Concrete Mold Co., 215 East River street, Peru, Ind., and by Heltzel Steel Form & Iron Works, Niles Road, Warren, Ohio. Write both of these firms for their latest catalog and prices. These forms have rigid side pieces of No. 10 Bessemer steel, with cross pieces of No. 8 Bessemer. These latter are made adjustable to any of the standard widths of walk. Flexible side pieces for curves are also provided, these being made of No. 12 spring steel. These forms guar-



Metal Forms for Concrete-Sidewalk Construction

antee a correct expansion joint, that requires no parting sand, and it is impossible for them to get out of square. They furnish a perfectly straight edge to draw on. Groover needs only to follow line made by removal of dividing plate, which is removed first, leaving side rail in long as possible to protect edge. They are easily kept clean and can be used at least two or three times a day—on a dry day four times. They are light to handle.

LITTLE GIANT CONCRETE MIXER

The Ballou Mfg. Co., 99 High street, Belding, Mich., manufacturers of the Little Giant concrete mixer, recently received the following letter from Blood Bros., Sumner, Ill., viz.:

"Dear Sir:—Replying to yours of the 31st from Dixon Springs, Ill., the mixer that we are using is called the Little Giant. We selected this mixer from among several others at the Chicago Cement Show two years ago. The first machine we bought was burned with our factory and the one you saw working is our second machine. We have never been sorry that we bought it and cannot say too much in praise of it, as the machine is almost perfect and is a great money maker.

"We average one yard of mixed concrete placed in the forms every nine minutes while the mixer is running. It reduces the cost of block making very materially, as one man can make from 25 to 30 more blocks per day than by hand mixing.

"We want to tell you that the mixer turns so easy that a man 64 years old stood at the crank and turned out 21½ yards of concrete, actual measurement in the forms, in just four hours and fifteen minutes."

CONCRETE BUILDING BLOCKS

In the March issue of Cement and Engineering News, on page 69, I note an article in regard to two cement product manufacturers in a western city disagreeing over the compression strength of concrete stone, and note that they want to, or are making concrete building blocks that will not stand only 600 lbs. per square inch. I desire to state I think it is time for both of these men to drop the old style tamp block system and get down to manufacturing a higher class of goods by the wet cast process which will stand a compression test of over 2,000 lbs. per square inch when blocks are but ten days old. This kind of building units will satisfy any building authorities in any city or any first-class architect.

They are also more easily made and are far superior to the old dry tamp system, and while they may possibly cost one or two cents more per block, they are well worth twice as much. There are now being manufactured a very high class of concrete building blocks by the cast process and are faced up with mica spar crystals which gives the block the appearance of a very high class cut granite at a much lower cost. This kind of work will no doubt take the place of all the dry tamp systems in the near future. Some tests have been taken at the U. S. Government laboratories recently whereby some blocks tested over 2,300 lbs. per square inch, at the age of 13 days, which is a much higher test than any dry tamp system will ever stand.

If any reader wishes any further information in regard to the minor details of concrete stone manufacturing I will be very glad to do all I can to assist him in making a high class product, as I am anxious to have the use of Portland cement developed in the proper manner, and not abused as it has been in years past. There is no limit to what can be done with Portland cement in the hands of skilled men. Yours truly, Stephen Hawkins, Architect and Builder Sewickley, Pa.

SACKETT DUMP CARS AND BUCKETS

The new catalog which the H. B. Sackett Screen and Chute Company, 1679 Elston avenue, Chicago, Ill., are mailing to interested parties is a worthy specimen of the printer's art—gotten up in rare good style. On page No. 2 the company states: "In presenting this catalog we have endeavored to convey a comprehensive idea of our product, comprising contractors' portable railways, mine and ore cars, dump buckets, turntables, switches, elevators, revolving screens, etc. The designs illustrated herein are the result of twelve years'

experience in building and designing industrial cars, buckets, elevators, and screens for all conditions of service. We are specialists in our line and are prepared to build special cars, etc., either from customer's plans or from designs of our own, developed from data and specifications furnished with inquiry. Our facilities for work of this character are the best, and being located where material can be purchased at the minimum and shipment made promptly, we are thus able to quote very low prices and make prompt delivery.

We also carry in stock standard sizes of cars and buckets.

WANTED & FOR SALE DEPARTMENT

FOR SALE.

We can save you 25 to 50 dollars on a concrete mixer. High grade machines, fully guaranteed. Get our price before you buy. Superior Mfg. Co., 1405 Concrete Ave., Waterloo, Iowa.

Chief chemist, at present employed, desires change of location. Can furnish best references from past and present employers. College graduate. 12 years' successful experience. Address W., care Cement & Eng. News, Transportation Bldg., Chicago.

FOR SALE.

Troeman balance, nearly new. Used one week in private laboratory. In perfect condition. Address E. D., care Cement & Eng. News, Transportation Bldg., Chicago.

WANTED

Position by experienced cement tester. Eight years practical experience. For particulars and references address H. R., care Cement & Engineering News. State salary paid.

WANTED

One No. 7½ Gyratory Crusher. Give full particulars and price in first letter. Address Box 20, care Cement & Engineering News, Chicago, Ill.



Our Molds and Construction Patented

Use Peerless Silo and Peerless Wall Molds

Peerless Silo Molds are the largest daily capacity molds on the market, building 7½ ft. daily, including chute, with same labor and cost as others build 4 to 6 ft. This means 3 to 5 days labor expense and time saved on every silo. It means one extra silo every month, the profits from which will PAY for a Peerless Mold in one season. THINK THIS OVER, and write for Peerless particulars.

Use Peerless Wall Molds and stop wasting lumber. Barns as well as silos should be of concrete. HERE IS TO THE ALL CONCRETE FARM BUILDINGS. Ask us about them.

New Enterprise Concrete Machinery Company
68 W. Monroe Street Chicago, Ill.

A "Batch-A-Minute" Mixer That Mixes Like A Big Paver.

Has same mixing action as \$2000 pavers—batch stirred 60 times in 60 seconds. Steel construction—semi steel gears mounted on steel trucks. 3 H. P. engine—steel engine housing. Low barrow hopper. 5 feet. Capacity up to 65 yards a day.

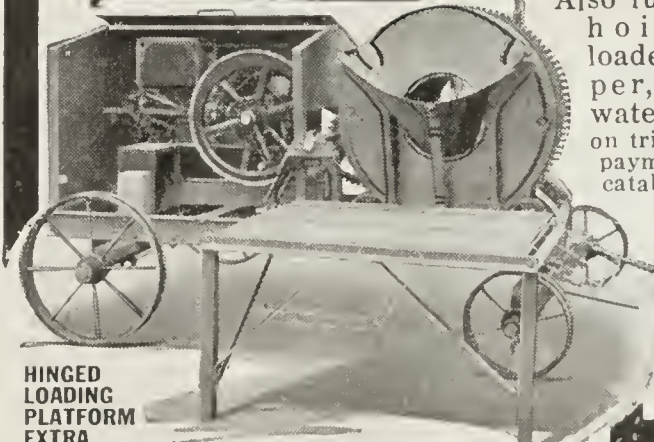
\$185

ASK ABOUT OUR
HAND POWER MIXER



LOWEST LOADING MIXER

Also furnished with hoist, power loader, batch hopper, measuring water tank. Sold on trial—cash or easy payments. Write for catalog today.



**CONTRACTORS
MACHINE CO**
130 11th St.
KEOKUK - IOWA

SLAG from blast furnaces for Concrete

Blast-furnace slag used as an aggregate in concrete represents economy, safety and strength

For many reasons, blast-furnace slag is an ideal concrete material—its alkaline nature, tending to prevent rust in reinforced concrete—its light weight, enabling it, in floor slabs for instance, to support a given live load with smaller dead load on supporting frame—its contents of silica, alumina and iron, which increases the permanency of any concrete of which it is a part—its fire-resisting qualities—these are some of the features which have impelled the most careful engineers and architects to specify slag in place of other concrete aggregates. The high crushing strength of slag-concrete has been demonstrated in various tests made of unprejudiced parties in nearly every large city. Slag-concrete has always developed strength uniformly higher than gravel-concrete or limestone-concrete.

Engineers and Architects

Blast-furnace slag as a concrete material is better understood than it used to be. Before you write your concrete specifications, get in touch with any of the following competing producers of blast-furnace slag—let them submit the results of long-time tests of slag-concrete.

Birmingham Slag Co.

1001 Woodward Building
Birmingham, Ala.

The Sommerfield Co., Inc.

1863 61st Street
Brooklyn, N. Y.

The France Co.

Second National Bank Bldg.
Toledo, Ohio



The Commonwealth Power Co. tunnel under Grand Ave., Milwaukee, Wis., recently successfully waterproofed with

“Hydrite”

COLORLESS WATERPROOFING

Hourly Leakage 5200 Gallons STOPPED! 700 ft. Concrete Tunnel 55 feet below datum was made watertight.

The success of our method eliminated the necessity of pumps and SAVED \$80.00 to \$100.00 PER MONTH.

In addition to the possibility of damage to the cables, etc., from the seepage. This tunnel, 10 years old, has been free from leakage for nine months, or since work was completed. We guarantee it to stay so.

HAVE YOU A WATERPROOFING PROBLEM?

Difficult waterproofing problems in NEW or OLD work can be economically and successfully solved. The experience of a successful organization is at your service and satisfactory results are guaranteed.

Our method of applying grout, internally or externally, under heavy pressure through pipes, or upon the surface, as the conditions require, is applicable to tunnels, reservoirs, foundations, basements, etc., of masonry or concrete construction. Leaks are not only stopped but the structures are strengthened.

Let us help you with your waterproofing problem. Write us concerning our product and methods. Ask for descriptive booklet.

WATERPROOFING COMPANY OF AMERICA MILWAUKEE, WIS.

Branch Offices:

543 McCormick Building, Chicago. Callahan Bank Building, Dayton, Ohio.
1014 Transportation Building, Montreal, Canada.

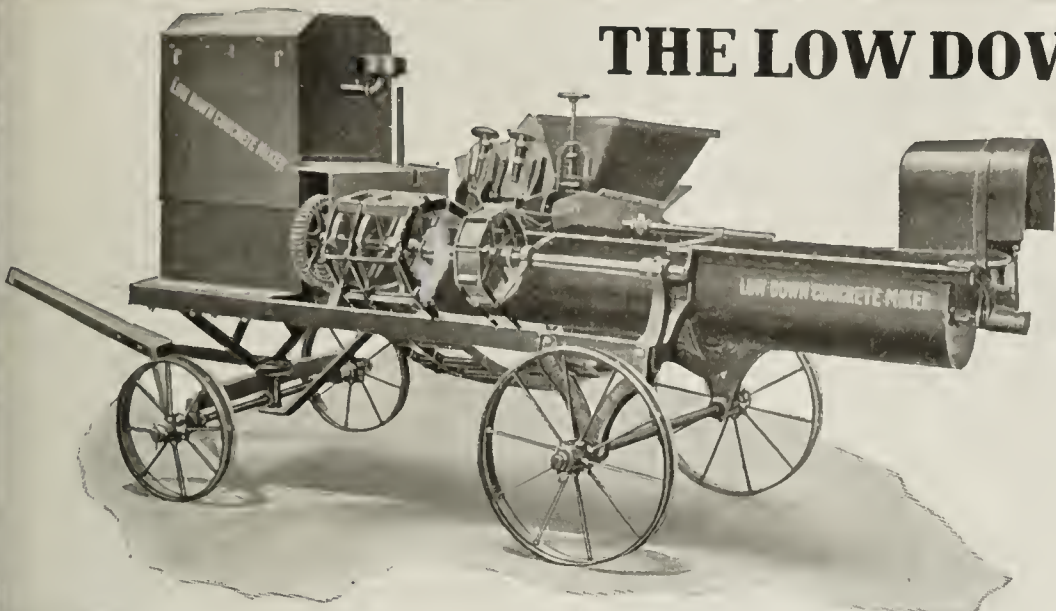


SIDEWALK FORMS CURB AND GUTTER FORMS

The contractor who bids on sidewalks, curbs, curb and gutters with the idea of using wooden forms is generally bidding under a definite handicap and will always do the work with less profit than he could with steel forms.

HELTZEL steel forms are the oldest on the market. They are built by the largest builders of concrete forms in the world. Spread over the work of a season or two they mean a lower form cost per running foot of sidewalk than the use of wood forms. They are easily assembled. Work is fine, accurate and even. Write today for Free Catalog.

Heltzel Steel Form & Iron Works
Niles Road, Warren, Ohio



THE LOW DOWN FORCE FEED MIXER

has a capacity of from 4 to 12 cu. yards an hour with a forced feed and stroke off measurement different from all others. It gives absolutely perfect proportions whether the materials are wet or dry. Cannot clog. You can set and lock the feed gates so there will be no variation.

Few parts, open-to-view mechanism and low down hoppers make this mixer economical in operation and upkeep. Feed can be changed without stopping the machine. Safety friction clutch enables you to stop or start the machine without stopping the engine. Construction perfect. Price remarkably low.

Find out more of the Low Down's good features. Send for Catalog "B," which gives detailed information. Mention Cement & Engineering News when writing.

ELITE MFG. CO., Ashland, Ohio

The HARDING MORTAR MIXER Successfully Mixes Hard Wall Plaster and Brick Mortar

The sensation of the Chicago and Omaha Cement Shows was the rapid, successful and thorough mixing of hard wall plaster with hair and fibre, lime mortar and Portland cement with the Harding Mortar Mixer. We mixed the actual material for the "show me" type of contractor, and made good with him.

With this Mixer you save the wages of one to six laborers on every job. One laborer can do the work of four; two men can do the work of eight.

You save one-quarter of your material bill. Thorough mixing permits use of more sand.

You get perfect mortar, impossible to get mixing by hand. Machine mixed mortar is uniform. It spreads easier, hangs together better and sets harder.

You make a good mortar man out of any laborer.

You have Mortar all the time, and exact amount to last you until quitting time. The machine is fast. A batch can be dropped out in ten times the time the material could be mixed in the box. Write us for proof from Contractors and details now. Sold on Free Trial.

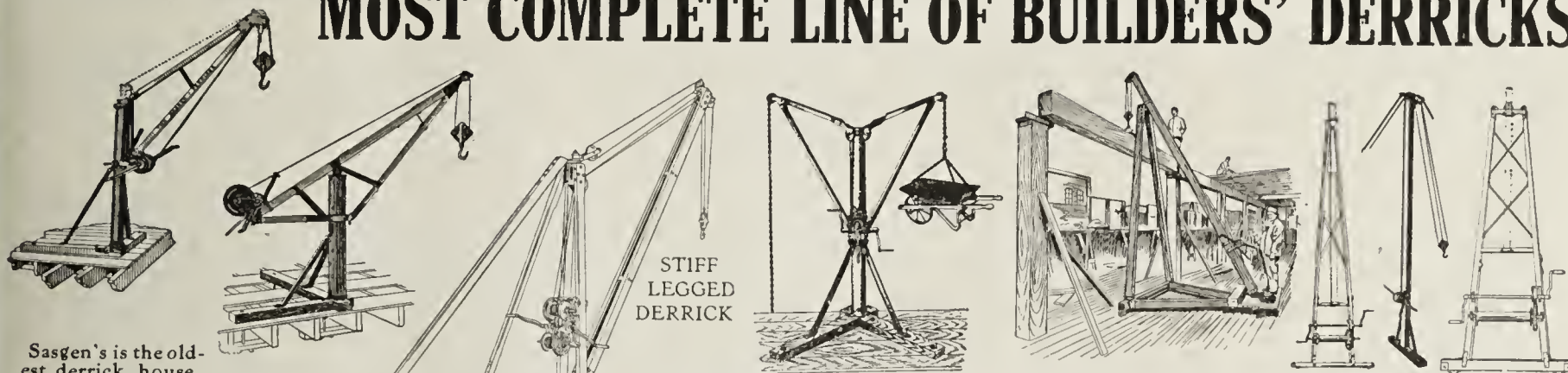
Architects are beginning to specify machine mixed mortar. An exceptional proposition for representatives in unoccupied territory.

The Mortar Mixer Corporation

700 Washington St.,

Iowa City, Iowa

MOST COMPLETE LINE OF BUILDERS' DERRICKS



Sasgen's is the oldest derrick house in the country. We make the strongest, best and most reasonable price derricks.

SASGEN DERRICK COMPANY,

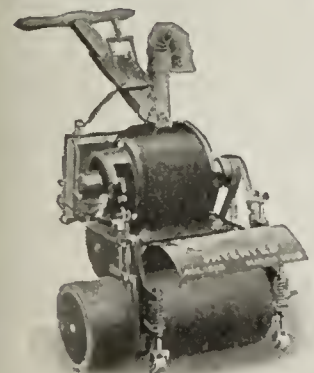
We manufacture Steel and Wood Circle Swing Builders' Derricks, hand and power. Pole. Setter, "A" Frame, Double Boom Wheelbarrows, Stiff Legged and Guy Line Derricks. Single and Double Drum Geared Winches, Blocks, etc.

2052 North Racine Avenue, CHICAGO

WRITE FOR CATALOG No. 15

TEST AND TRY BEFORE YOU BUY

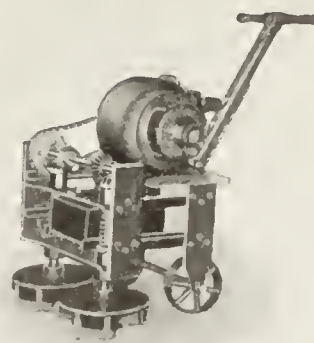
The Schlueter Rapid Floor Surfacer



The Schlueter BALL BEARING electric floor surfacing machines for mosaic, marble, composition and wood floors are the most simple constructed machines on the market. Direct chain drive AUTOMATIC DUST COLLECTORS. No gears or clutches to wear. Made in various styles.

OVER 5,000 IN USE ALL OVER THE WORLD

Send for prices and free trial proposition



THE M. L. SCHLUETER CO.

225 W. Illinois Street, CHICAGO

GET THE LANSING HABIT

Contractors Are Finding It Not Only a Difficult One to Overcome, But a Profitable One to Form.

We Are Headquarters
For Everything in
The Concrete Line



These 1915 Model
Lansing Mixers
are making great records for low concrete
costs and troubleless operation.

HERE IS OFFERED

Sturdy Construction—LONG LIFE—
LOW OPERATING COST—STEEL
CUT GEARS; machined track and
trunion rollers; heavy steel channel
frame; high, wide wheels; low charg-
ing hoppers; powerful engines; fric-
tion clutch like an automobile;
batch hoppers or side loaders.

Tell Us What You Need and We Will Tell
You What It Costs. Ask for Catalog No. 354

LANSING COMPANY

LANSING, MICHIGAN, U. S. A.

or address our nearest warehouse.
We carry stocks at the following:

Southern Factory—Parkin, Arkansas.
Boston—78 Cambridge St. Charlestown District.
Chicago—169 West Lake Street.
Kansas City—1413-1415 West Tenth Street.
Philadelphia—Willow and No. American Streets.
New York—285-289 West Street.
Minneapolis—330-334 First Street, North.
San Francisco—338-348 Brannan Street.

MONEY FIRST

It would be preposterous to make a statement of
this kind if we were unable to support it. Money ap-
peals to the business man; it's attractive, it's what we



are all working for, and if our
proposition is a worthy one there
can be no higher calling than the mak-
ing of money legitimately. Some
men work for a dollar a day, others
for twenty-five dollars a day—the
difference being just twenty-four
dollars. The power and influence of
the twenty-five-dollar man is greatly
enhanced, and he ought to be just
that much better fitted for doing his
part of the world's work. All of
this presupposes that what we have
to offer in quality or merit backs up
the statement. If we have worked
out a system and are able to provide
the equipment that will convince the
Cement Contractor that he can make
\$50.00 a day by the use of the
Conklin Monolithic Silo Molds
where heretofore he has been able to
make but \$10.00, it shows plainly
that we can make five blades of grass

grow where but one grew before. We can increase his efficiency
five times.

To any one interested, we will prove to their satisfaction that
we can do that and more. We start you in a paying business
with a small investment. May we prove it to you? Write for
Catalogue.

CONKLIN CONSTRUCTION COMPANY
430 Main Street, Hartford, Michigan

The Perfection Concrete Stave Silo

made by the "wet mix" system.

The staves are so formed that any diameter of silo
can be built. The staves are made by the "wet mix"
system by casting them in our steel moulds. The prod-
uct is a strong, non-porous, water proof stave, made
with common labor and right at the "silo job." No fac-
tory required; you save railroad freight, loading and
breakage of staves.

Our "All-Steel Door-System"

is ideal and just what the silo feeder demands. Doors
continuous from bottom to top of silo; size 24x25 inches
in the clear.

Concrete Workers

get into the Concrete Stave Silo business. It is a
growing and permanent business, and our system makes
you big Profits.

Get the best form of construction—one that can not
be out classed later.

Get the "Perfection."

Write us to-day for our liberal proposition to supply
you with our steel moulds and exclusive territory. Let
us give you facts and figures on ease of erection, per-
manency of construction and low cost and big

Profits

to you. You will be highly interested. Write to-day.

Perfection Concrete Stave Silo Co.

506 Clapp Building

DES MOINES, IOWA

"Little Giant" (Model A) For Small Jobs

Price, \$75.00 f. o. b. Belding

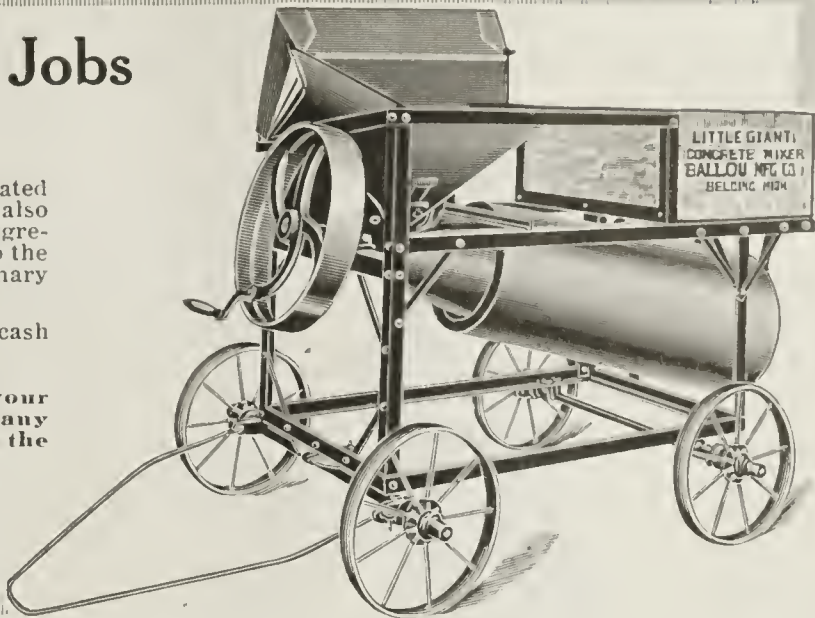
This Hand-Power Concrete Mixer has a proportioning device which can be regulated so closely that it will vary less than one-half of one percent. Special means are also provided for thoroughly blending the ingredients, and for properly wetting the aggregate. Its blend will bear the very closest inspection. We don't claim a man can do the work of an engine, but reports from users show that 5 yards per hour is quite ordinary with a "Man at the Crank" of our "Little Giant" Model A.

We also build Power Mixers with steady running Air-Cooled Engines. For spot cash we will pay the freight on machine shown. Complete satisfaction guaranteed.

Do not take our statement for it, but let us send the mixer and leave it to your judgment while on the job. We will send a mixer on five days' trial to any responsible party, or upon guarantee of payment or deposit of price while the mixer is being tried out. Send for Catalog.

BALLOU MFG. CO.,

99 HIGH STREET
BELDING, MICH.

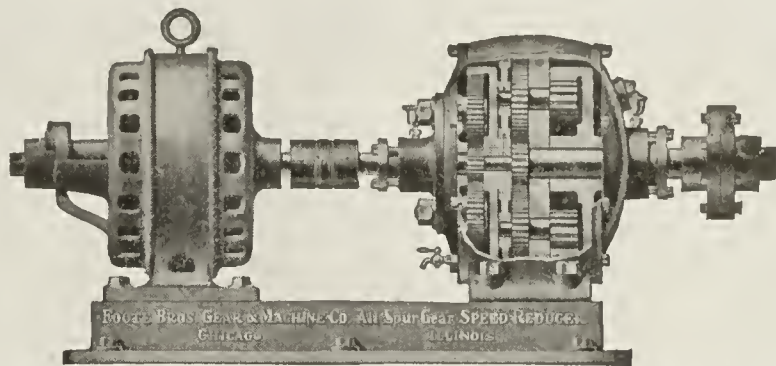
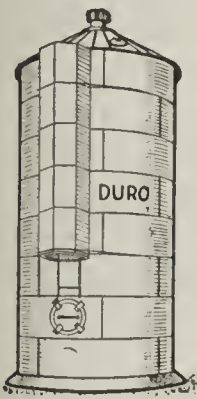


"DURO" METAL Tops—Doors—Frames and

Forms for Erecting
Concrete Silos and Tanks
PURE IRON GALVANIZED

will last as long as the silo.
Write for prices. Manufactured
only by

**C. C. Fouts Co., 220 Canal St.
Middletown, Ohio**



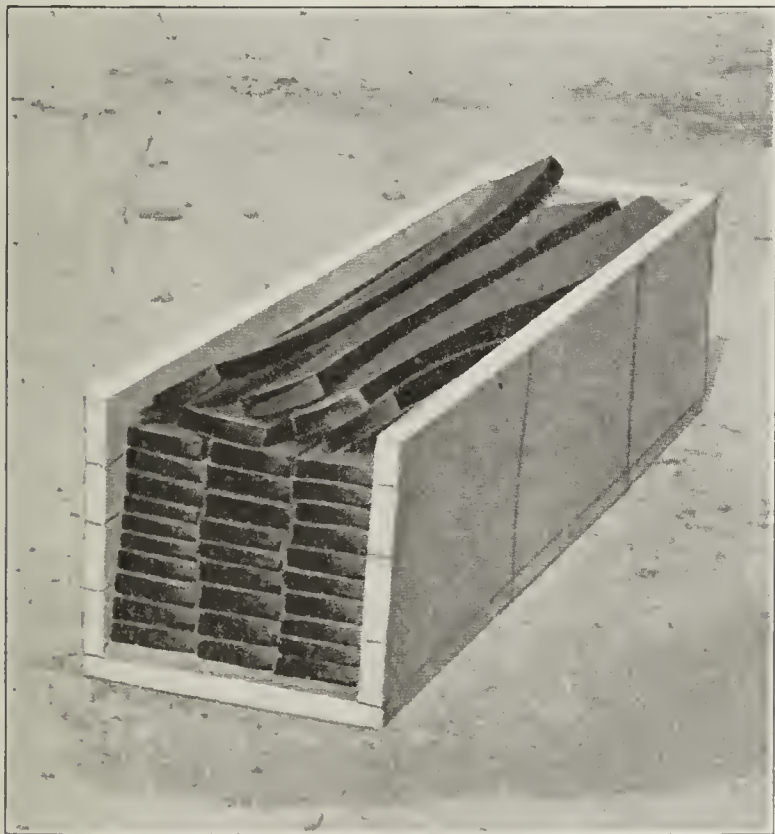
SPUR GEAR SPEED REDUCERS

Note they are dust proof, compact, made in any horse power or reduction. Just what is needed on conveyors, elevators and reduction of speed anywhere. We manufacture cut gears. Send for catalogue.

Foote Bros. Gear & M. Co.

210 to 220 N. Carpenter St., Chicago

Genasco Expansion Joints



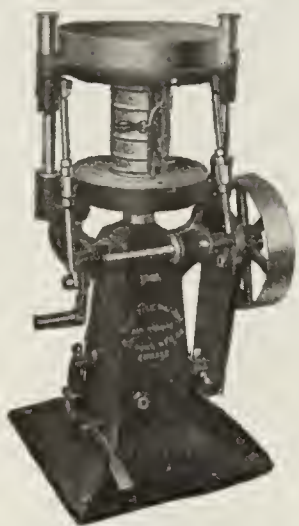
have all the advantages of other prepared joints for concrete, wood-block, brick and granite-block pavements—**economy, ease of installation, the avoiding of melting and pouring**—and besides this

Are All Asphalt

The **entire thickness** of a Genasco joint serves the purposes of expansion and contraction. Ready-made joints that contain felt or some other form of re-enforcement cannot do the work of the Genasco all-asphalt joint. Any thickness or depth.

The best way to judge this joint is to see it. A life-sized sample will be sent to any one interested. Write for it today.

THE BARBER ASPHALT PAVING COMPANY
Philadelphia, Penna.



The Reason Why You Are Not Making Cement Drain Tile Is Because You Have Not Yet Investigated Its Possibilities

The superiority of cement tile for drainage purposes is **known**; there is no competition in quality or price. For this reason its future use is assured, as well as its present use.

The cement drain tile business does **not** require a large investment—nor skilled labor—nor hard selling. A few hundred dollars will start you right; you can use unskilled labor; you can sell all the tile you manufacture without any difficulty.

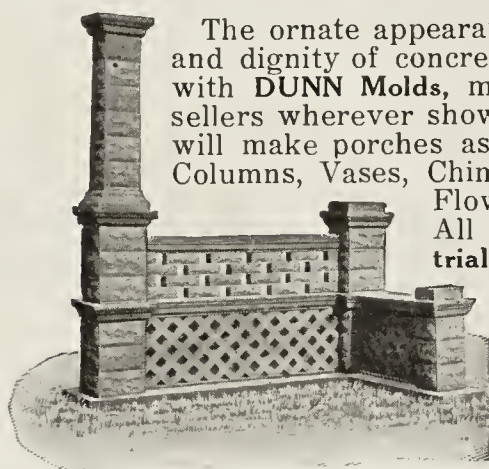
And we are prepared to guarantee profits ranging from **\$230 to \$800** a month.

Ask us today for printed proof of comparative costs and profits in making tile; we send this information free upon request.

Dunn equipment is sold on 15 days' trial; write for the tile equipment catalog. Price of Dunn No. 1 Tile Machine.....

\$165

Concrete Porches Pay a Bigger Profit Than You Think.



The ornate appearance, permanence and dignity of concrete porches made with **DUNN Molds**, make them ready sellers wherever shown. Dunn Molds will make porches as illustrated, also Columns, Vases, Chimneys, Balusters; Flower Boxes, etc. All sold on 15 days' trial.

Write for Porch Mold catalog today. Price of outfit for making porch as shown,

\$39



Don't Tamp Sewer Pipe—POUR IT!

Tamping a semi-dry mixture, to make large drain tile and sewer pipe, is not only slow, troublesome and costly—but **unnecessary**. Pouring a wet mixture into **DUNN Molds**, besides being the most efficient method, assures the strongest product. Reduces manufacturing costs, too, and increases the profits.

Dunn Molds permit the manufacture of all size pipe, from 6 to 36 inches in diameter. All sold on 15 days' trial: Pipe Mold catalog gives full descriptions and prices, ask for a copy. Price of 12-inch mold.....

\$7.50



Pat's No. 842262 and 782700

Here's Mixer Value Out of the Ordinary

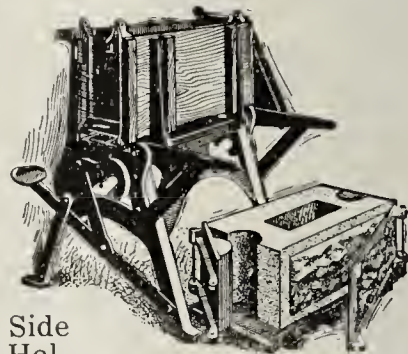
Let **facts**—not claims—influence your buying judgment. You buy concrete mixers because of what they **are**, not because of what they are claimed to be. To learn about the Dunn construction is to learn the reasons why a **DUNN Mixer** is the mixer you have waited for.

Dunn Mixers have four mixing blades and extra long drums, giving them the highest possible mixing efficiency. The convenient loading height and the **power discharge** feature, save labor. Their capacity—a batch a minute—is assurance of ample speed. The one-piece hollow yoke makes the operation almost noiseless. The all steel and iron construction is evidence of long life.

Write today for catalog describing all styles and sizes. We sell on 15 days' trial. Prices.....

\$67.50 to \$224

Use Three Block Machines—but Buy only ONE



To make Face Down, Side Face and Two-Piece Hollow Wall Cement Blocks **usually** requires three machines. But one **DUNN Combination Cement Block Machine** will make all three types. Saves two-thirds the usual investment.

By using a wet mixture it saves considerable tamping, and makes a stronger block. And a special off-bearing system protects each block against breakage. Capacity, 150 blocks daily.

Sold on 15 days' trial. Write for Block Machine catalog. Price.....

\$40

The Concrete Fence Posts that Sell the Quickest



Are those of high quality and moderate price. These are the kind that **DUNN Fence Post Molds** made. The Dunn system enables quick and economical manufacturing. Tamping is eliminated by our special **Vibratory Base** which compacts each post to uniform density and firmness. Made in batteries of four and ten. Sold on 15 days' trial. Price of 4-mold battery.....

\$12.50

W. E. Dunn Mfg. Co.
4139 Fillmore St., Chicago



Stop Splitting Sacks Architects Condemn Guesswork

THE FULL SACK SIZE BOSS

Mixer Sells for No More Than You've Paid for a Half Sack Mixer.

Minneapolis, Minn., April 2, 1914

We are well pleased with The Boss. It certainly does everything in the mixing of concrete that any of the high-priced and heavy cast iron mixers does. We find that the steel construction stands up better and it gives us the advantage of a very light mixer that we can move any place in the city. Yours truly,

Nelson-Enblom Construction Co.

GEARLESS
POWER
LOADER
(Steel)



BUILT OF STEEL

Half a Ton Lighter—30% Stronger Than Cast Iron Mixers.

WHY PAY \$200 TO \$350 MORE?

BOSS Mixers have same remixing action as mixers costing \$200 to \$350 more. Same dependable engines (Novo or Ideal) and more power for work because Hyatt Roller Bearing saves 17% of engine power. Used and approved by U. S. Government and largest contractors in U. S. and Canada.

BUILT IN 3 SIZES

6-8-10-12 Ft.

Low Hinged Platform—Measuring Batch Hopper (equipped to suit you).

Sold on Trial—Cash or Easy Payments

Write for Catalog.

The American Cement Machine Co., Inc.

9635 Johnson St.

KEOKUK, IOWA

Stock Carried in All Large Cities

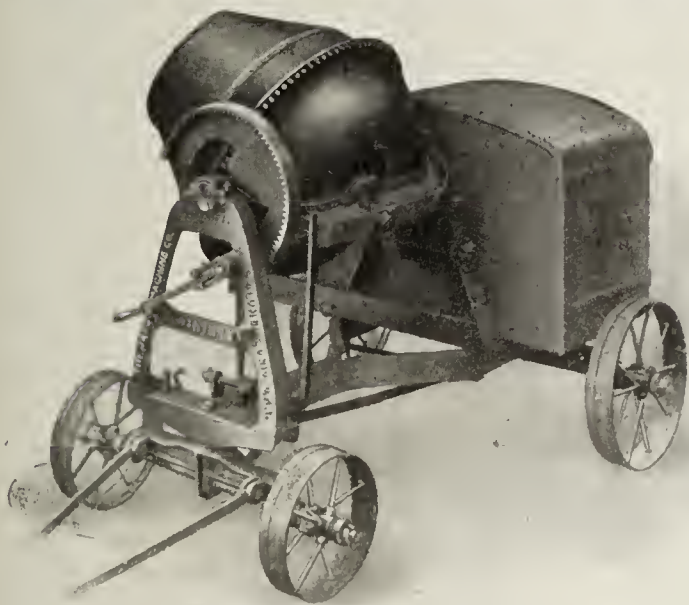
THIS MACHINE IS
EQUIPPED WITH
HYATT
FLEXIBLE
ROLLER
BEARINGS

"Light Weight"
BOSS
Steel King Mixer

STOP! LOOK! LISTEN!

Just the Mixer You've Been Wishing for

THE BIG-AN-LITTLE



Just a little bit better than the one you thought was best

1915 Model NOW READY

The small mixer has proved its worth. Contractors see that it pays better to have one or more small portable mixers than to mix by hand or to have a great big clumsy mixer. The question has been to get a DEPENDABLE Small Mixer at a low price.

The Big-an-Little is the biggest and best small mixer on earth, and our low prices amaze the mixer world.

Your neighbor has one. They are used everywhere. Ask him.

Write us

The Jaeger Machine Co.

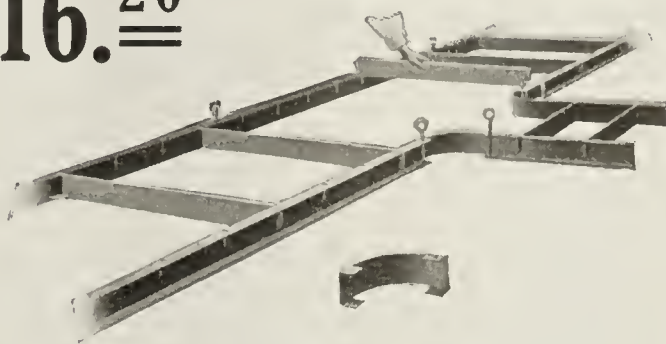
212 W. Rich Street

Columbus, Ohio

There's Sense in Steel

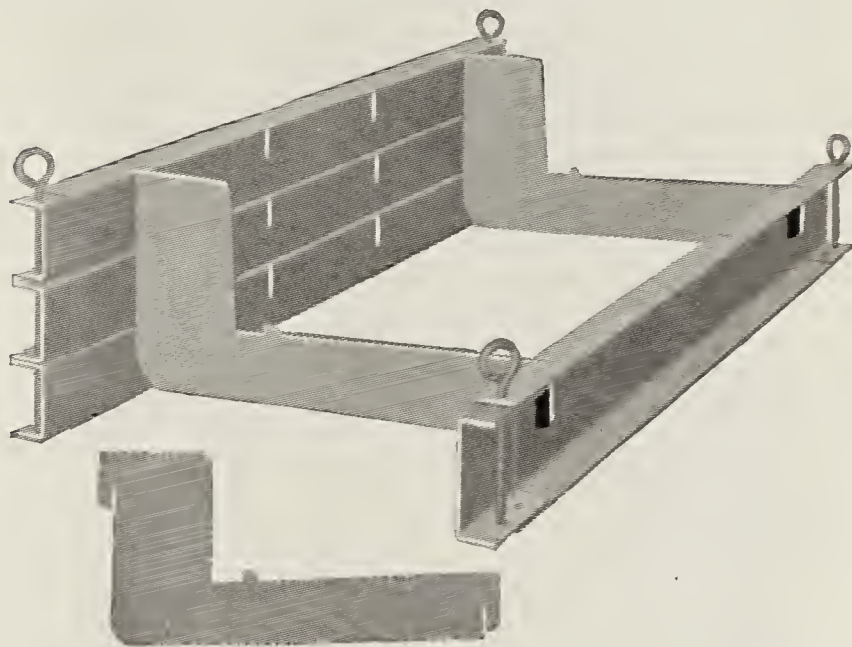
just as well as there are cents in the use of Indiana Steel Forms.

For **\$16.²⁰**



you can buy enough Indiana Steel Sidewalk Forms to lay 66 running feet of walk per day.

The sense of buying these particular steel forms for your work lies in the fact that the same forms can also be used for curb and gutter construction by simply adding the curb and gutter steel dividing plate.



Steel Forms mean permanent equipment. That's why many of the largest and smallest contractors are using steel forms in place of wood.

Steel means smooth, clean work. Indiana Steel Forms are simple in construction. No wedges, pins, ratchets, bolts or nuts to bother with. You will see the advantage of them after a try out.



You Can't Overlook the Above Offer

It is limited, so better write for more particulars right now. Surely you cannot afford to putter along with wood forms when you can buy steel forms at this price.

Write for Our Literature

Indiana Concrete Mold Co.

215 East River St.,

Peru, Indiana

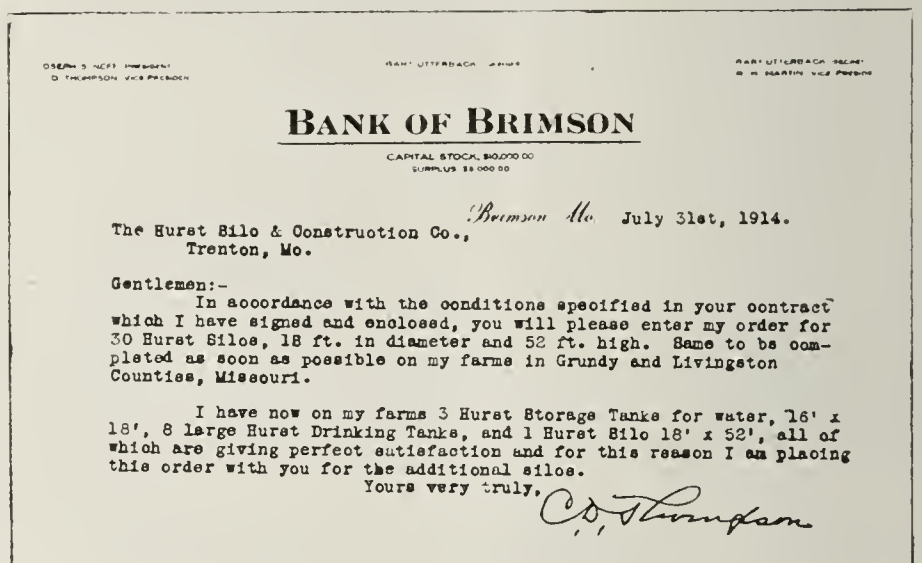
HURST SILO

TEN YEARS AND NOT A FAILURE!

That's the Record



The largest order ever given in the U. S. for Concrete Silos. C. D. Thompson, of Trenton, Mo., places his order for 30 Hurst Silos, 18 feet in diameter and 52 feet high.



Hurst Silos are built of reinforced concrete blocks, made in Hurst Patented Molds using the poured system—a dense block water-proof and of tremendous crushing resistance.

The Hurst System of Silo Construction will interest you. It is inexpensive and enables anyone to turn an investment into quick money. Farmers recognize the Hurst Silos as a sure and safe investment.

What The Hurst Silo & Construction Company, builders of Hurst Silos, write us will interest you. Read it: July 31st, 1914 we purchased the exclusive right to manufacture Hurst Silos and Tanks in 35 counties in Missouri and 5 in Colorado.

August 1st we commenced our factory at Trenton. August 14th we were making blocks.

October 22d we had erected 15 silos with 3 more delivered ready for erection, with 4500 blocks curing in the yard.

This, in spite of the fact that we had no salesman employed and did not get started before most silo firms had discontinued business for the winter.

To take care of our business we expect to establish 6 to 10 factories in our territory, each with a capacity of one silo per day.

Our molds, having a capacity of 1 silo per day, cost us less than \$1000.

The Hurst System of reinforced concrete construction reduces to the minimum time, labor, expense and competition.

We have some more openings for live, responsible parties, but they are going fast. Don't put it off, but act now.

Write for Particulars and Catalogue

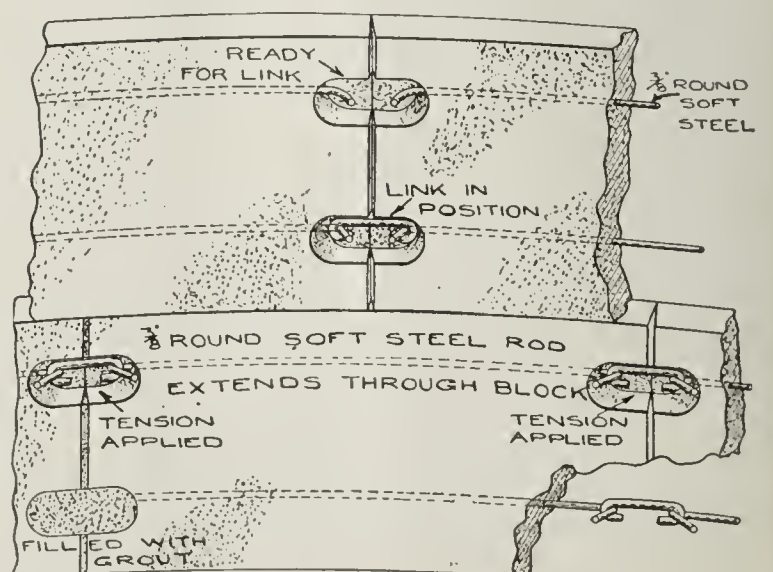
The Chas. B. Hurst Company

Established 1904

819-829 Exchange Ave.

Union Stock Yards

Chicago

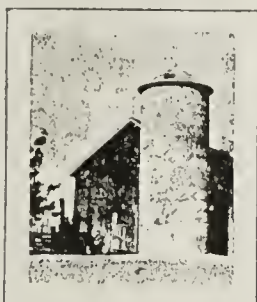


The HURST Reinforced Block for Tank and Silo Construction

THE POLK SYSTEM

RENDERS THE SERVICE

READ THIS



HOPPER & SON
CONTRACTORS OF CONCRETE SILOS AND WATER TANKS

OWNERS OF POLK SYSTEM (PAT.) OF MONOLITHIC CONSTRUCTION
IN STATE OF KANSAS

MANHATTAN, KANSAS, Jan. 27/13.

Polk Genung Polk Co.,

Fort Branch, Ind.

Gentlemen:-

We built seventy six silos, grain tanks and water tanks, with your machines last summer. Up to date we have not had a single complaint. About \$4.00 for each machine, for hoist ropes and bolts, covers cost of repairs for the season.

With these machines we find that we can meet all competition, both as to quality and price.

Yours,

Hopper & Son

A QUESTION—

Isn't it about time that you were getting acquainted with the—

POLK SYSTEM?

Polk-Genung-Polk Co.

Fort Branch, Indiana

A New Principle Invented in Cement Stave Silo Construction A Needed Improvement. Silos, Tanks, Etc., Built Any Size Desired

Mr. S. T. Playford, the originator of cement stave silos, has purchased an absolutely new type of silo. Those who have seen it—and who have made searching comparison with Mr. Playford's earlier efforts in cement stave silos, are united in saying that this invention creates a new standard by which silos must now be judged. This new silo will be known as the S-T-P. The S-T-P Silo embodies the latest, up-to-date knowledge and experience in silo building. Being a new silo, we are not forced to cling to old ideas, patterns and machinery. We have in the most original manner produced a silo that is strikingly different—a silo of incomparable strength and matchless durability and efficiency. The S-T-P will enable you as a contractor to offer an A-No. 1 business proposition to the farmer. The

S-T-P Silo

"SILO THAT'S PERFECT"—Invented by W. A. Hillman

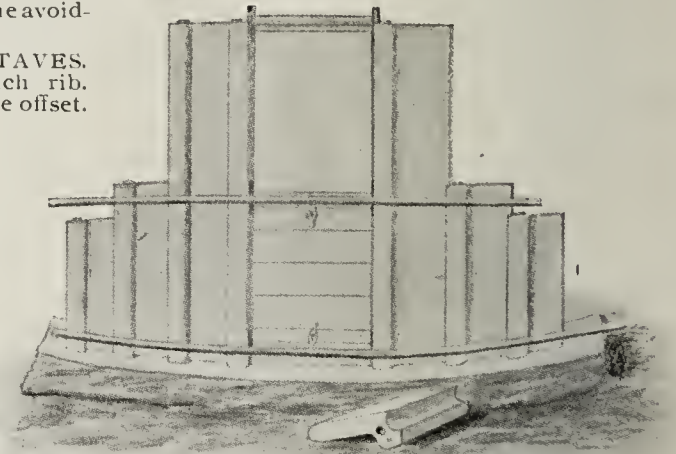
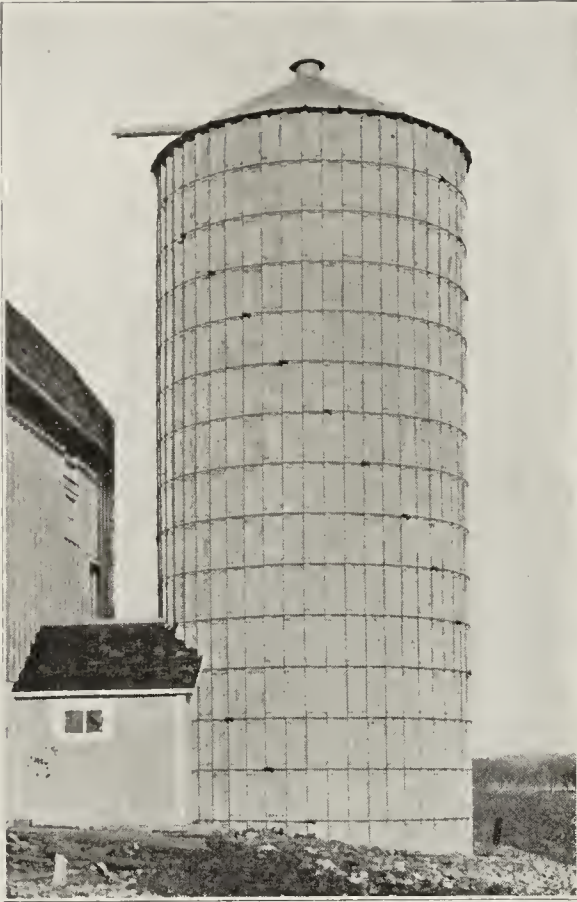
The more you know about silos, the more you will appreciate the S-T-P. The less you know about silos the more important it is that you learn about the "S-T-P." It means the avoidance of dissatisfaction and money losses.

The "S-T-P" is made of SLUSHED STAVES. Thoroughly reinforced. Has a $4\frac{1}{2}$ inch rib. Pointed up on the outside. The hoops are offset. This to give a ladder to work upon.

Write for circular,
prices and further
information

**PLAYFORD
MFG. CO.**

298 Douglas Avenue
ELGIN, ILLINOIS



Minnesota Cement Construction Co., Long Prairie, Minn. Andrew Nordloef, Mgr. for Minnesota, No. and So. Dakota, Iowa Nebraska and Wisconsin

You Can Drive Staples Into this Cement Post

If you are going into the post business, why not commence on a *business-like basis*? Equip your plant with our molds, make your posts *wet*—make this a *real business*, not a side line. No *experts* necessary nor a large force of men required to run a *1,000 mold plant*, for *one man can make 200 posts in 10 hours* with material prepared.

Here's a real live wire. The best in the cement field today, as proved by Staple Post plants all over the country.

Yes, this is the STAPLE CONCRETE POST!

You Fasten the Fence Like It Were a WOODEN Post!

Furthermore, our staple-receiving composition is as durable as concrete—no wood. Does not add $\frac{1}{10}$ cent to cost of post. Holds staples, regardless of age.

This in Itself is Enough

to justify the reputation the Staple Post has earned of being the only *real* substitute for wood.

But Besides

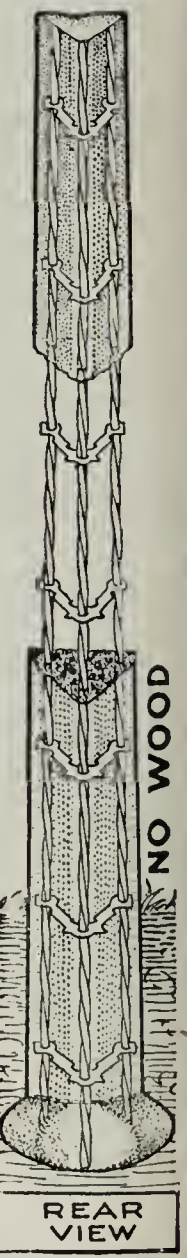
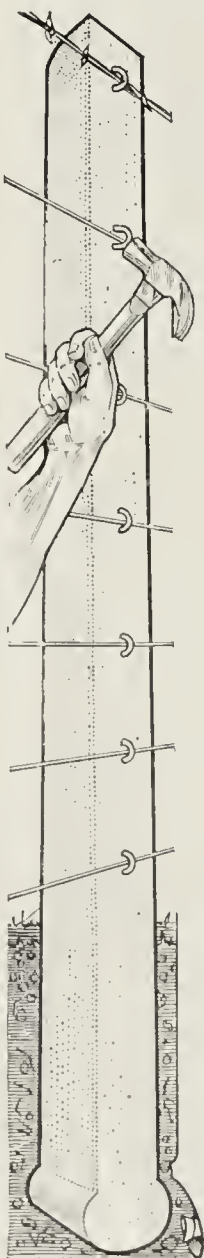
The *reinforcement* is the strongest known—the rods are firmly held *near the corners*.

The weight, 50 lbs., makes the Staple Post the lightest, effecting a very great saving in material, handling and freight.

Our system has been so carefully worked out that the initial cost to manufacture—the only cost—is surprisingly low.

Write Us—We Want to Tell You About a REAL BUSINESS

STAPLE POST MOLD CO. - 453 W. HOME STREET WESTERVILLE - OHIO





MEDUSA WHITE PORTLAND CEMENT

THE FIRST TRUE WHITE PORTLAND EVER MANUFACTURED

MEDUSA is unexcelled for building ornamentation, stucco, concrete building blocks, interior decoration, statuary, cemetery work, parks and grounds, tile, mosaic, setting marble, limestone or brick, etc. It can be used for exterior as well as interior work, and with it results rivaling that of the best white marble can be obtained.

The U. S. Government has used Medusa White in many Post Offices and other buildings, which should be conclusive evidence of its high quality. It is guaranteed to be a high-testing Portland passing standard specifications. Give Medusa a trial and be convinced of its superior quality.

Don't fail to write for our new booklet of illustrations and testimonials

SANDUSKY PORTLAND CEMENT CO.
SANDUSKY, OHIO



FRENCH'S PORTLAND CEMENT

Samuel H. French & Co.
PHILADELPHIA

HIGHEST STANDARD

Established 1844

DANIEL B. LUTEN

INDIANAPOLIS

Designing and Consulting Engineer

Reinforced Concrete Bridges Exclusively

Associate Engineers in each State

The Post that Will Not Rust,
Rot, Break or Burn, but Gets
Better Every Year

PATENT NO. 1,107,406

THE

UNIVERSAL CEMENT POST

is the only cement post to which a plank fence may be attached without the use of a single nail. It is the only cement post which holds the fence in such a manner that it is impossible for cattle to ride it down, or hogs to go under it.

Further, it is the only cement post for building speedway and ball park enclosures; fastening of boards is an easy matter.

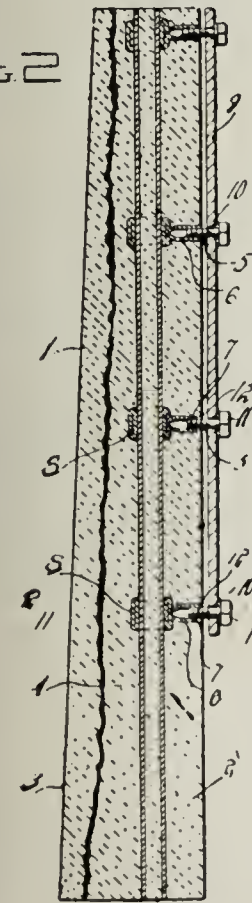
This post will not break at the ground. Our special process of reinforcing takes good care of that part. Can be made in any shape, design or length to match any design one may want to carry out.

The Universal Cement Post is the only all-feature post on the market. Large corporations want this post. A live state agent is wanted to take care of the demands for this post in each state and Canada.

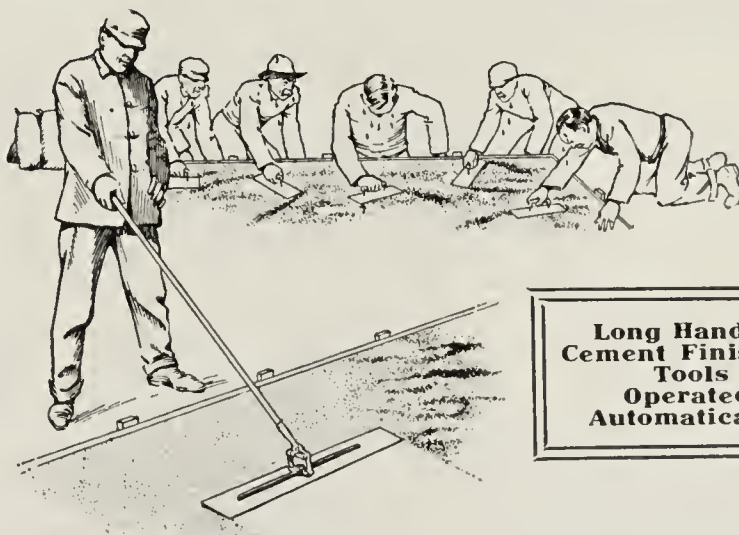
My mutual plans will be profitable to all concerned. Write at once. Address all correspondence to

F. W. GOTTLIEB

General Agent
MORRISTOWN, INDIANA



SERIAL NO. 829,291



One Man With The Double Action Cement Tools Can Do the Work of Five

in a given time with old style finishing tools— which means a SAVING of EIGHTY PER CENT OF THE FINISHING COST OF YOUR WORK.

All Our Finishing Tools Work Automatically

Finishing Trowel has 24-inch blade; 16-inch trowel with jointer attachment, edger and float.

BETTER WORK AT LESS COST

Send For Catalog and Prices

ABRAM CEMENT TOOL MFG. CO.
DUGGER, IND.



Smith Mixerette Facts and Figures

The Bleicher Concrete Co., Kenosha, Wis., purchased the first Smith Mixerette that was built. Here's what they have to say about their machine and some of their records as given in their letter of October 26th, 1914.

"We bought one of your Smith Mixerettes six months ago and find it to be a great labor saving machine. With three men we are able to put in 1,000 square feet of sidewalk in 9 hours with the aid of your mixer. Recently I put in a foundation 35 ft. by 42½ ft. by 1 ft. (55 cu. yds.) with your Mixerette in 9½ hours.

"It is a wonderful machine and I can recommend it to any one desiring to reduce their labor expenses, for I know how much can be accomplished with it."

This dandy little mixer holds a five-foot batch of dry, loose material, 3 cu. ft. of mixed concrete. It will easily turn out 5 cu. yds. per hour.

Compared with other five-foot mixers, the price of the Smith Mixerette is as low or lower and back of it is the guarantee of the biggest concrete mixer manufacturers in the country.

\$128.00 on skids with pulley and feed chute.

\$246.00 on steel truck with 2 h. p. gasoline engine, steel house and low charging, gated batch hopper.

\$315 on steel truck with 2 h. p. gasoline engine, steel house and ground level power charger.

Get all the data by filling in and mailing the Coupon for Mixerette Proposal and Booklet No. 107-B.

MAILING COUPON

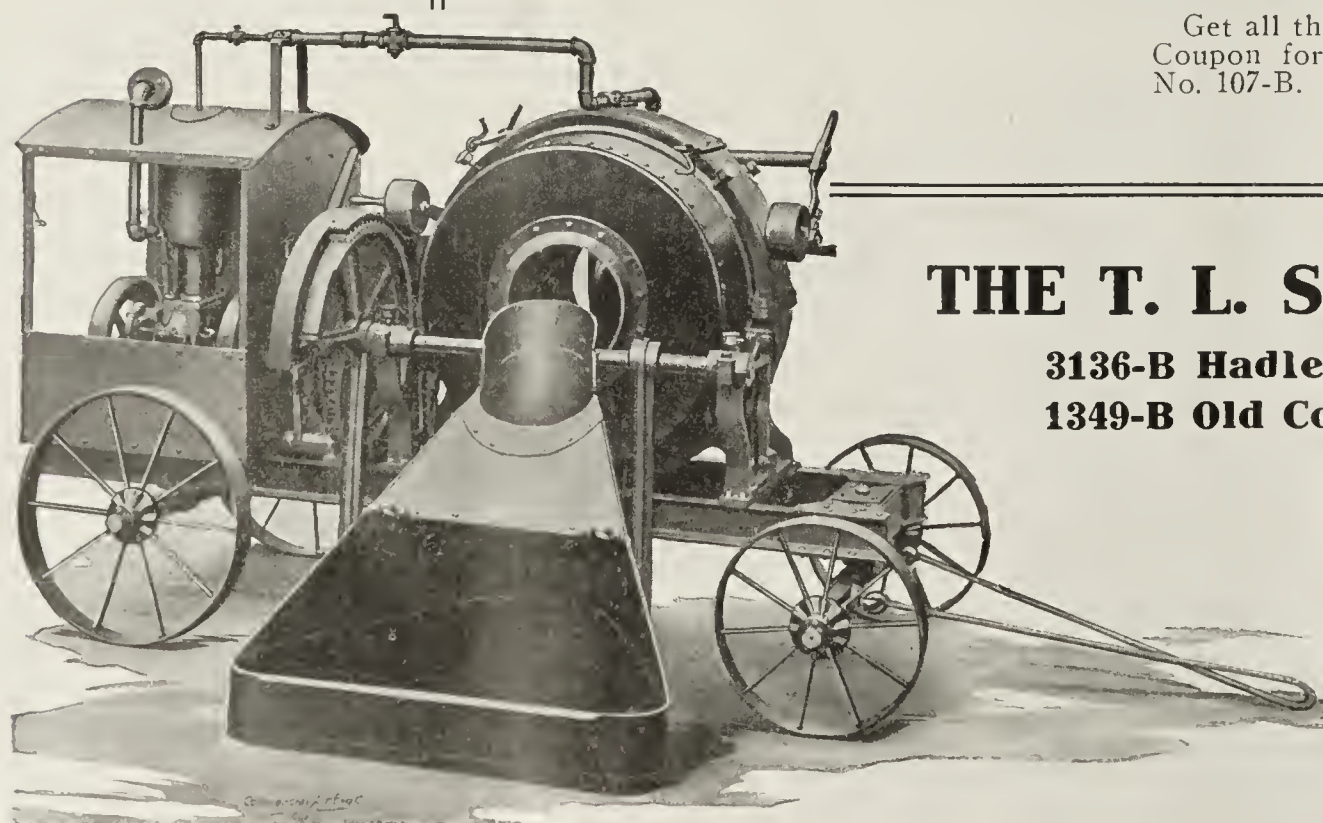
Send me, without any obligation on my part, SMITH MIXERETTE Proposal and Booklet No. 107-B.

Name.....

St. Address or P. O. Box.....

City..... State.....

NOTE—Fill in this coupon and mail it to either address given in this advertisement.



THE T. L. SMITH COMPANY

3136-B Hadley St., MILWAUKEE, WIS.

1349-B Old Colony Bldg., CHICAGO, ILL.

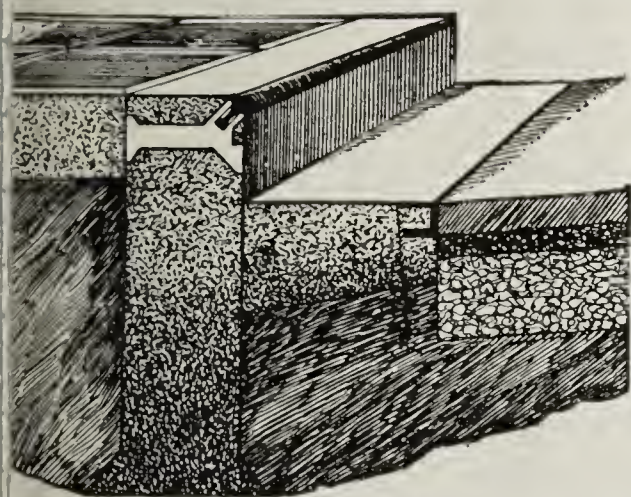
WAINWRIGHT STEEL-BOUND CONCRETE CURB

HAS A RECORD OF
SIXTEEN YEARS' USE WITHOUT A FAILURE
ABSOLUTELY NON-BREAKABLE. CHEAPER THAN GRANITE

THIS CURB WILL STAND HARDER
USE AND LAST TEN TIMES AS LONG
AS PLAIN CONCRETE CURBING

"WAINWRIGHT
PATENTS"

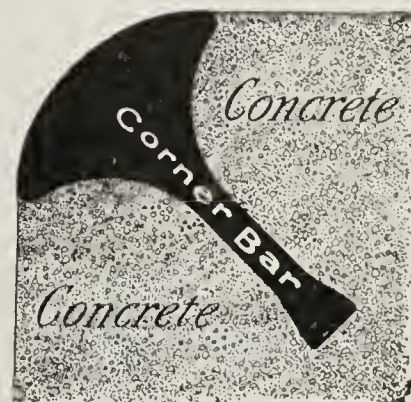
March 9, 1897
November 22, 1898
May 5, 1903
March 26, 1907
August 29, 1907
August 2, 1910



GALVANIZED STEEL CORNER BAR PREVENTS
CHIPPING OR BREAKING ON
EDGES

OVER
EIGHT MILLION
FEET

IN USE IN MORE THAN
FIVE HUNDRED CITIES
IN THE UNITED STATES



MECHANICALLY PERFECT AND
UNEQUALLED FOR CURVED
CORNERS

THE WAINWRIGHT GALVANIZED STEEL CORNER BAR

IS THE ONLY BAR THAT CAN BE DEPENDED ON TO PERMANENTLY RETAIN ITS PLACE IN CONCRETE. THE RECOGNIZED MERITS OF THE WAINWRIGHT BAR HAVE MADE IT THE STANDARD CORNER BAR FOR CONCRETE PROTECTION, AND IT HAS BEEN SPECIFIED FOR YEARS BY THE UNITED STATES GOVERNMENT, LEADING CITY ENGINEERS, RAILROAD OFFICIALS AND RESPONSIBLE CONTRACTORS.

THIS BAR IS SELF-ANCHORING, THE DOVETAILED WEB HOLDING IT FIRMLY IN PLACE EVERY INCH OF ITS LENGTH, PRESENTING A RESISTING DEPTH OF TWO INCHES OF SOLID STEEL, AT EVERY POSSIBLE POINT OF IMPACT.

THE SUPERIORITY OF THE WAINWRIGHT GALVANIZED STEEL CORNER BAR OVER COMPETING DEVICES IS DUE TO THE SOLID ROUNDED HEAD AND CONTINUOUS INTEGRAL ANCHORAGE, ALSO GREATER WEIGHT OF RESISTING MATERIAL.

FROST WILL NOT DISPLACE THE WAINWRIGHT BAR AS IT
WILL ANY BAR ANCHORED AT INTERVALS

SEND FOR BOOKLET NO. 4

STEEL PROTECTED CONCRETE CO.

Real Estate Trust Bldg., PHILADELPHIA, PA.

HYDRATED LIME

added to concrete makes it denser, stronger and watertight

DR. E. W. Lazell, the well known lime expert, says: "The denser the mortar or concrete, the greater the strength, other factors being equal. This fact is, I think, generally admitted. If, then, hydrated lime increases the density, the strength of the mortar or concrete must be increased. The question therefore resolves itself into proving whether or not hydrated lime increases the density.

"It is well known that mortars composed of Portland cement and sand are harsh working and non-plastic, that is, they are not easily molded or troweled. These harsh mortars require considerable manual work to mold or to form into any given shape. The addition of hydrated lime overcomes this harshness, rendering the mortar more plastic. It must therefore follow that the same amount of manual labor in molding or troweling will produce a denser mass.

"In the writer's opinion, the greatest advantage of the use of hydrated lime is this quality of rendering the mortars more plastic, the increased plasticity resulting in greater density. Exactly the same argument applies to concrete. Concrete containing a small amount of hydrated lime is much more plastic and smoother working than similar concrete containing no hydrate. Because of this greater plasticity the same amount of tamping would result in a denser concrete. The part played by the hydrate is wholly mechanical, imparting greater density to the concrete. It is further a well known fact that lime paste tends to retain its mechanically mixed water, thus hydrated lime retards the drying out of both mortar and concrete and supplies the water necessary for the full development of the strength of the cement. This quality of hydrated lime is particularly valuable when used in cement mortar, since the affinity of the hydrate for water keeps the mass damp and allows the cement to gain its full strength."



St. Louis Builds World's Largest Mechanical Filter Plant

Edward E. Wall, Water Commissioner, St. Louis, Mo., says:

"The design provides for forty 4,000,000 gallon daily filter units, each 50 x 28 ft. in plan, supported on concrete columns 20 in. square, spaced 11 ft. on centers north and south and 10 ft. 3 ins. on centers east and west.

"On the original basin floor inverted concrete arches were laid to distribute the foundation loads of the columns. The filter boxes rest on the reinforced concrete floor formed by leveling up the groined arches joining the tops of the columns. Each filter box is poured as a monolith, the concrete mixture being 1:2:4, with 25 lb. of **HYDRATED LIME ADDED FOR EACH BARREL OF CEMENT, FOR THE PURPOSE OF MAKING THE BOXES WATERTIGHT.**"

Below are some notable concrete structures recently built in which Hydrated Lime was used in the concrete work to make the concrete dense and thereby rendering the concrete more water proof:

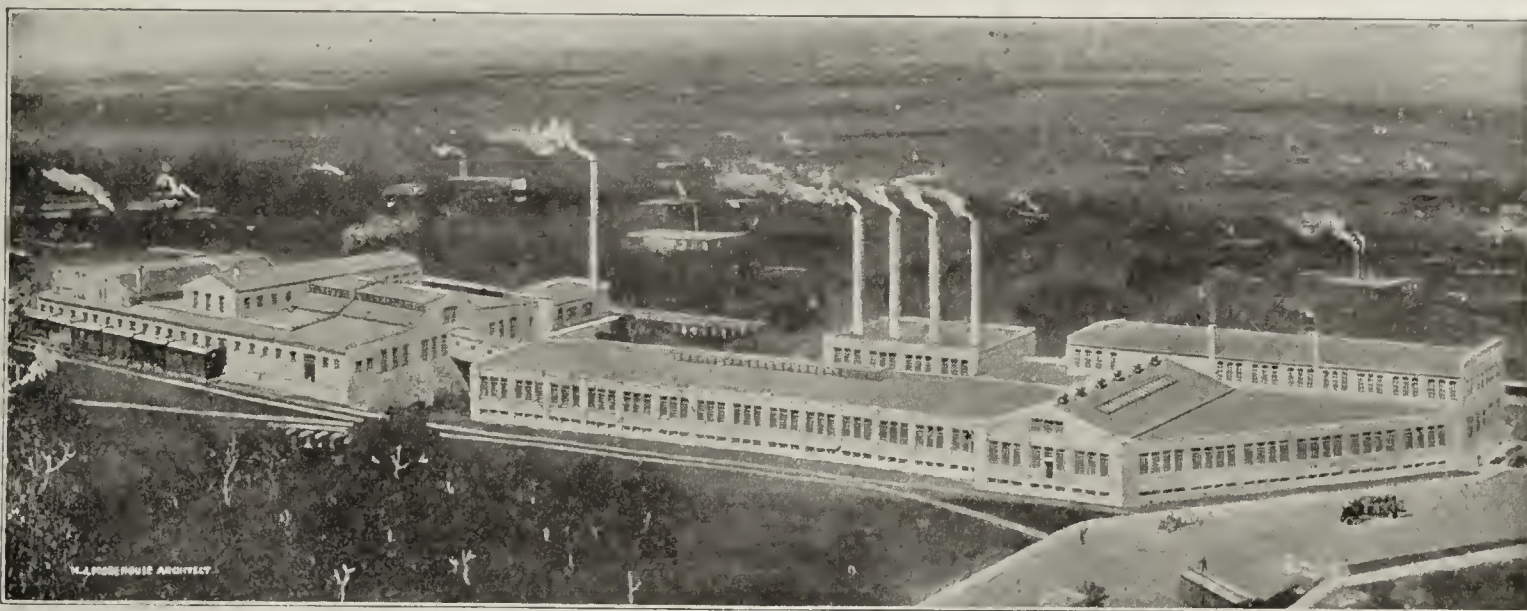
Full detailed information of the methods and cost of using Hydrated Lime may be secured from any of the following manufacturers of Hydrated Lime:

Longview Lime Works,
Birmingham, Ala.
Saginaw Lime & Lumber Co.,
Saginaw, Alabama
Charles Warner Co.,
Wilmington, Del.
Marblehead Lime Co.,
Chicago, Ill.
Ohio & Western Lime Co.,
Huntington, Ind.
Security Cement & Lime Co.,
Hagerstown, Md.
Lee Lime Co.,
Lee, Mass.

Charlevoix Rock Product Co.,
Charlevoix, Mich.
White Marble Lime Co.,
Manistique, Mich.
Glencoe Lime & Cement Co.,
St. Louis, Mo.
Dutchess County Lime Co.,
Dover Plains, N. Y.
Rockland & Rockport Lime Co.,
101 Park Ave., New York, N. Y.
The A. & C. Lime Co.,
Canton, Ohio.

Kelley Island Lime & Transport Co.,
Cleveland, Ohio.
National Lime & Stone Co.,
Carey, Ohio.
John D. Owens & Son Co.,
Owens, Ohio.
Woodville Lime & Cement Co.,
Toledo, Ohio.
National Mortar & Supply Co.,
Pittsburgh, Pa.
Rapid City Gypsum, Lime & Portland
Cement Co., Rapid City, S. D.

Gager Lime & Mfg. Co.,
Chattanooga, Tenn.
Dittlinger Lime Co.,
New Braunfels, Tex.
Round Rock White Lime Co.,
Round Rock, Tex.
Riverton Lime Co.,
Riverton, Va.
International Lime Co.,
Sumas, Wash.
Standard Lime & Stone Co.,
Fond du Lac, Wis.
Union Lime Co.,
Pabst Bldg., Milwaukee, Wis.

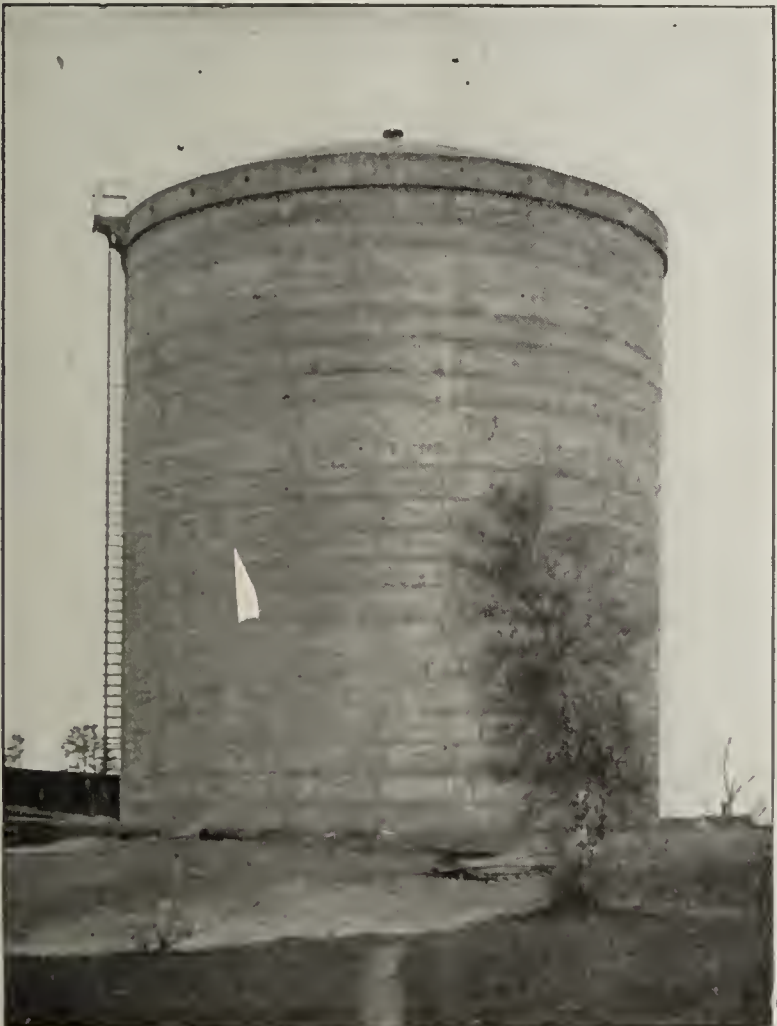


To protect a basement of 31,500 sq. ft. of floor space against an eight or nine foot head of water, was the problem that confronted the builders of the plant, shown above, the magnificent home of the Michigan Carton Co., Battle Creek, Mich.

The basement of this plant is 14 feet high, 75 feet wide and 420 feet long. The building stands on very low, marshy ground, on what was formerly, in fact, the bed of the Kalamazoo River. At present, however, the stream has been diverted and flows like a mill race, in times of high water, between the main buildings. At such times the water rises to a depth of 8 or 9 feet above the floor level and the rear wall of the basement must act as a retaining wall against the flood.

"Hydrated Lime" was the happy and effectual solution of this difficult problem and the interesting facts are given by Mr. M. J. Morehouse, the well-known architect of Chicago, who had charge of the work.

The floors and walls are of concrete, both waterproofed, the latter up to a height of 10 feet. The mixture used was one part cement, four and one-half parts of sand and gravel, and seven to eight per cent by weight of cement of "Hydrated Lime."



REINFORCED CONCRETE RESERVOIR, LISBON FALLS, MAINE.
To Make this Reservoir Watertight Hydrated Lime Was Added Equal to 8% of the Cement to the Concrete When It Was Being Mixed.



CLACKAMAS DAM, BUILT BY THE PORTLAND (OREGON) RAILWAY, LIGHT & POWER COMPANY.

90% Portland Cement; 10% Hydrated Lime.

Hydrated Lime is simply commercial lime scientifically slaked in the process of manufacture. It is shipped to you in 40 lb. paper bags or 100 lb. cloth bags, and there is no fire risk connected with its storage.

Test and Try Before You Buy

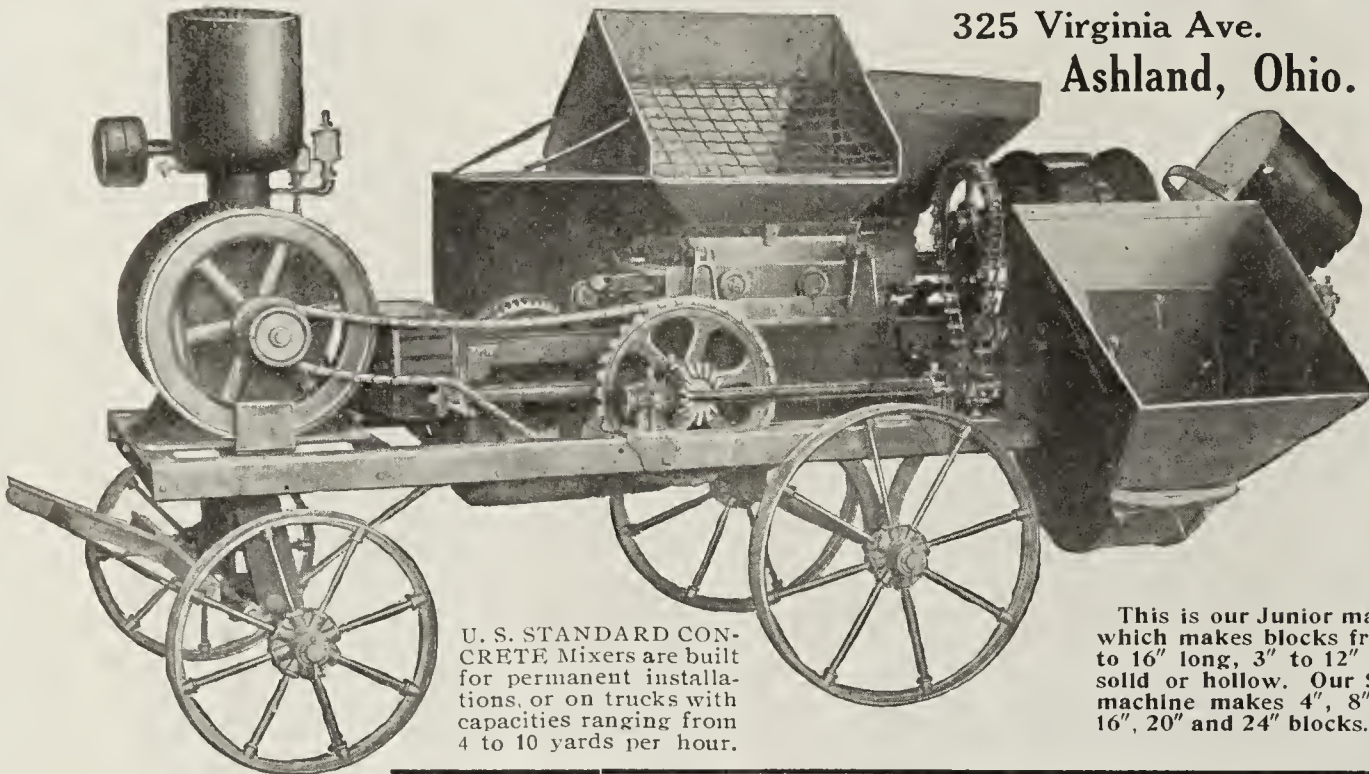
It Is Your Privilege to Test the U. S. STANDARD CONCRETE MIXER Before You Buy

The U. S. STANDARD CONCRETE MIXER is a continuous mixer with a positive measuring, proportioning and feeding device which makes it more accurate than any batch mixer ever made, because it does not depend upon the brain of the operator. It will stand the hardest tests put to it. There are no weak parts in it to cause break-downs, or defective operating parts to cause delay. All parts are interchangeable; workmanship the best. Warranted to embody the most practical and up-to-date working principles. Simple operations change the adjustments to suit any worker. Is giving excellent satisfaction to users. All we ask is a chance to have you try our mixer. We will operate the mixer to your satisfaction on the job, or no sale.

WRITE FOR CATALOG
"A"

U.S. STANDARD MANUFACTURING CO.

325 Virginia Ave.
Ashland, Ohio.



U. S. STANDARD CON-
CRETE Mixers are built
for permanent installa-
tions, or on trucks with
capacities ranging from
4 to 10 yards per hour.

This is our Junior machine
which makes blocks from 4"
to 16" long, 3" to 12" thick,
solid or hollow. Our Senior
machine makes 4", 8", 12",
16", 20" and 24" blocks.

We also manufacture the famous U. S. STANDARD Block Machine. Turns out solid or veneer blocks, as well as hollow blocks with oval air spaces. It is built in two sizes, and is so designed that it handles wet mixture perfectly, resulting in a block of unusual density and strength. For speed they cannot be surpassed.

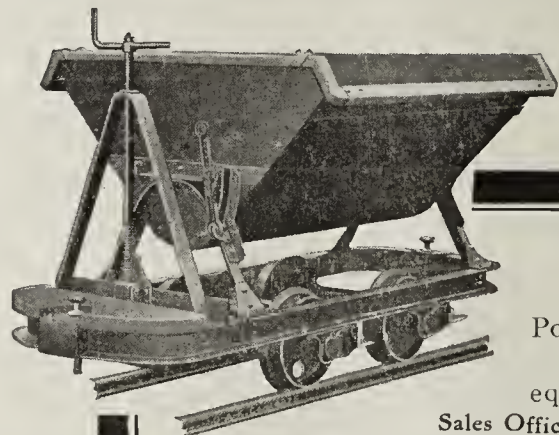


LET US SHOW YOU that there is more money in building concrete culverts over our forms, than in any other branch of your business. One form adjusts to any size from 20 inches to 48 inches in diameter, so you need but one investment for all your culvert work. We also make an arch form, adjusting from 6 to 12 feet. One of these forms will insure you all the culvert building in your vicinity at profits that will exceed any other branch of your contracting. Write at once for free catalog and special offer to contractors.

The Merrillat Culvert Core Co.

Dept. G.

Winfield, Iowa



**For Rent
For Sale**

—Cars—

All Types and Sizes.
Portable Track, etc.

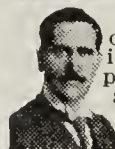
New or second hand
equipment.

Sales Offices—New York, Pittsburg,
Chicago, San Francisco.

Plant
Koppel, Pa.

ORENSTEIN-ARTHUR KOPPEL CO.

**More Power
For
Less Money** **6H \$98.75**

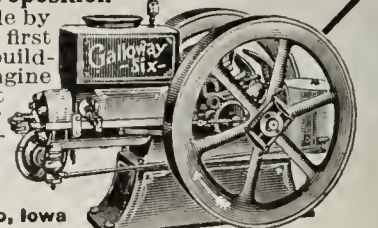


The New Galloway Masterpiece "Six" is the most down-to-the-minute engine that mechanical ingenuity can produce. It is perfectly adapted to furnish power to the shop, the mill, the contractor anywhere and where ready, steady, reliable, efficient and economical power is needed.

My New 1915 Proposition
is the greatest offer ever made by any manufacturer and is the first time in the history of engine building that an A 1 high-grade engine of this h. p. could be bought for so low a price. Write for particulars and price-reducing sliding scale schedule.

**Wm. Galloway, Pres.
The Wm. Galloway Co.**

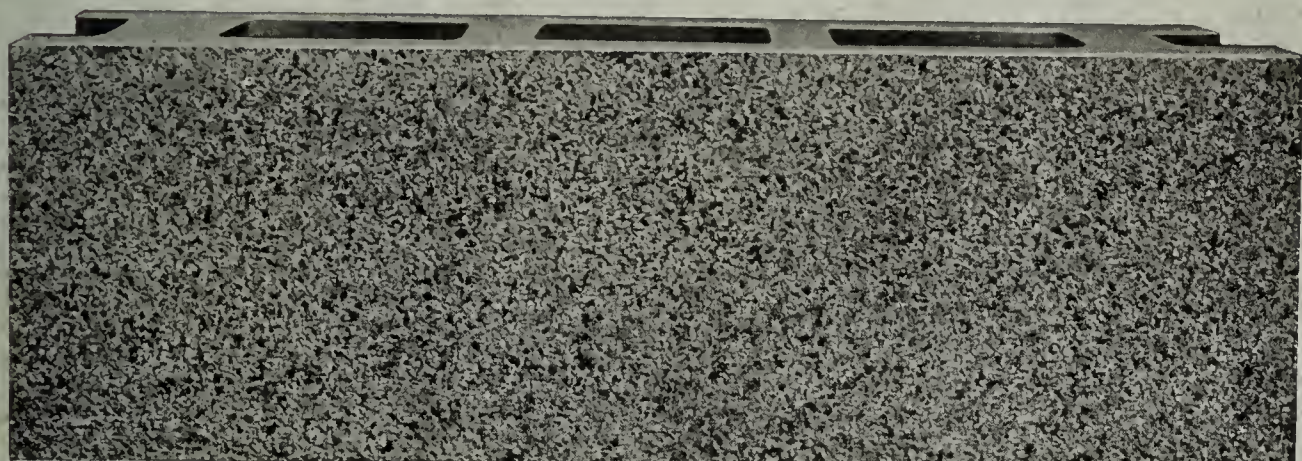
1935 Galloway Station, Waterloo, Iowa



ZAGELMEYER SYSTEM

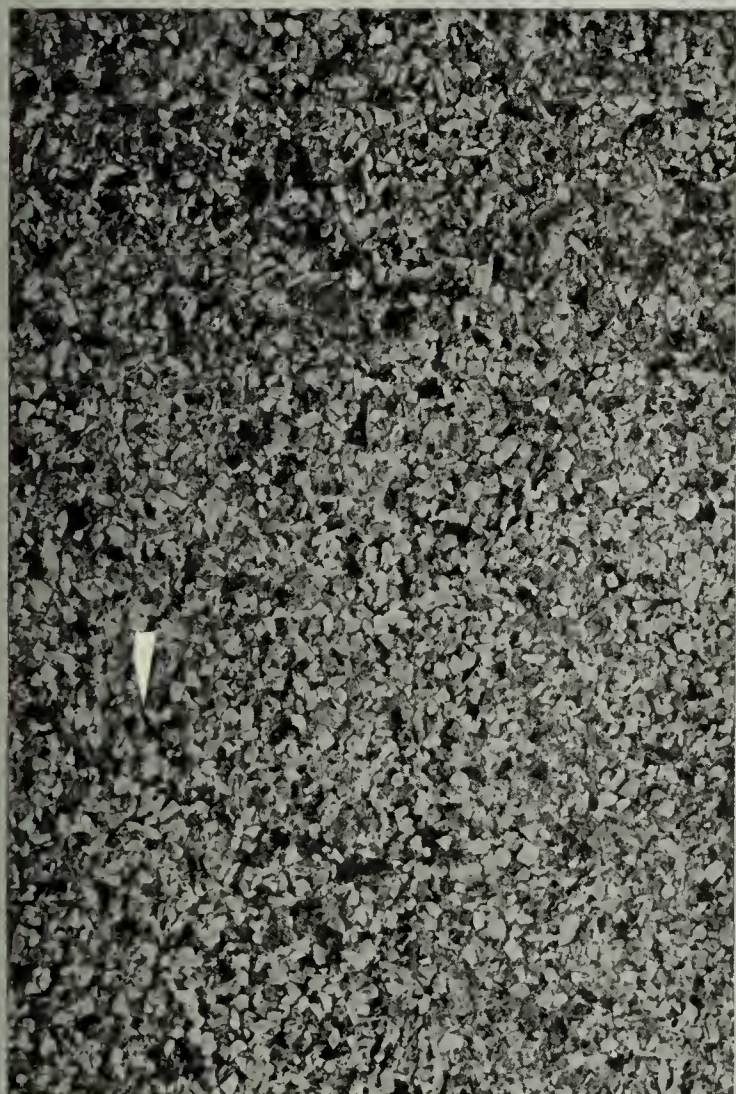
OF CASTING

Hollow Cement Building Blocks WITH GRANITE FACES



8x8x24 inch Granite Smooth Face Block

*They Cost Less
They Sell for More
You Sell More of Them*



Enlarged View of Granite Smooth Facing

BY A NEW process, which protects the facing, while the block is being cast, we eliminate all traces of cement from the face of block and nothing but the GENUINE GRANITE SHOWS IN ALL ITS SPARKLING BEAUTY.

These cuts show blocks just as they came from the molds, they are not treated with acid or scrubbed with brush, or sprayed.

We challenge the whole world to show us a cement block, made by any other system, at any cost, that equals these blocks for beauty, strength, quality or imperviousness to heat, cold or moisture.



8x8x24 inch Granite Rock Face Block

Send us fifty cents and we will send, freight prepaid, to any point in the United States, east of the Mississippi and north of the Ohio Rivers, a granite-faced block, one-half rock-faced and one-half plain-faced. **YOU WILL SAY WHEN YOU GET IT THAT YOU NEVER SAW A CEMENT BLOCK BEFORE.**

They are positively cheaper to make than the ordinary dry-tamp, sand faced block.

MR. BLOCK MAKER: What show will you have if your competitor secures the exclusive right for this system in your city?

ASK US ABOUT OUR MOLDS FOR MAKING SILO BLOCKS.

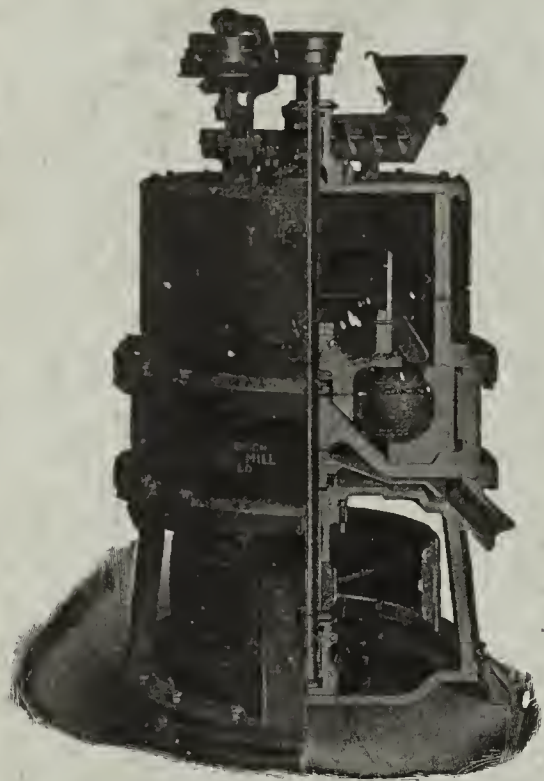
Send for a Catalog fully describing our system and showing our multiple molds mounted on trucks, for casting hollow cement building blocks.

Zagelmeyer Cast Stone Block Machinery Company

25 Crump Avenue

BAY CITY, MICHIGAN

The Fuller-Lehigh Pulverizer Mill.



Produces Commercially

Cement having a higher percentage of Impalpable Powder than can be obtained by any other mill. Tests show that the tensile strength of a 1-5 mortar made with cement pulverized by the Fuller Mill is higher than the tensile strength of a 1-3 mortar made with cement pulverized to the fineness required by the Standard Specifications.

Lehigh Car, Wheel & Axle Works

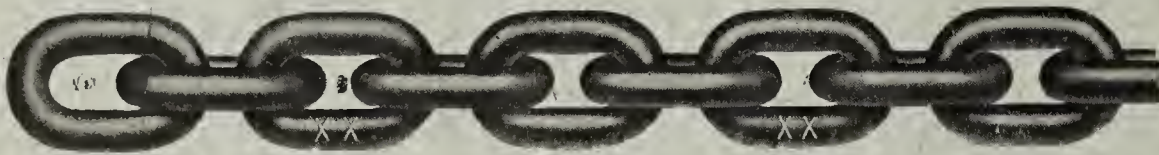
Main Office: Catasauqua, Pa.

New York
N. Y.

Hamburg
Germany

Cement Companies
equipped with
Fuller Mills
advertise the fact that
The consumer
gets
38 pounds more
of the

Impalpable Powder
or
Real Cement
in every barrel of
cement produced by
The Fuller Mill
than by any other.



"OLD RELIABLE" "XX"—Our Motto is "QUALITY FIRST"

You may buy some cheaper grades of Shovel Chain than "XX" but our High Grade "XX" Chain is always cheaper in the end. Send for catalogue and prices.

"OLD RELIABLE"
"XX" SHOVEL CHAIN

Some manufacturers make several grades of
so-called Shovel Chain.
We make one grade.

Made only by THE HAYDEN CORBETT CHAIN CO.,

Columbus, Ohio

WE CAN MAKE PROMPT SHIPMENTS OF

DU PONT

EXPLOSIVES

AND BLASTING SUPPLIES

DESPITE the present demand for explosives, our facilities for securing materials, the operation of extensive powder plants equipped with special machinery and expert employes, and ample storage and shipping arrangements enable us to promptly and satisfactorily fill all orders.

Over a century's experience in the explosive field gives us a practical knowledge of its requirements. The superiority of our products is recognized by world-wide demands.

Specify DU PONT when purchasing explosives and blasting supplies, and be assured of prompt shipments, uniform quality and maximum efficiency.

DU PONT POWDER CO.

Established 1802

WILMINGTON, DELAWARE

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JUN 2 1915

CEMENT AND ENGINEERING NEWS

Vol. 27 TRANSPORTATION BUILDING, CHICAGO, JUNE, 1915 No. 6

F. L. SMIDTH & CO. ENGINEERS

50 CHURCH STREET NEW YORK CITY

Designers, Equippers and Builders of
Portland-Cement-Making Factories

KRUPP Grinding Machinery **THOS. PROSSER & SON**
24 Platt St., NEW YORK Old Colony Bldg., CHICAGO



SPECIAL OFFER

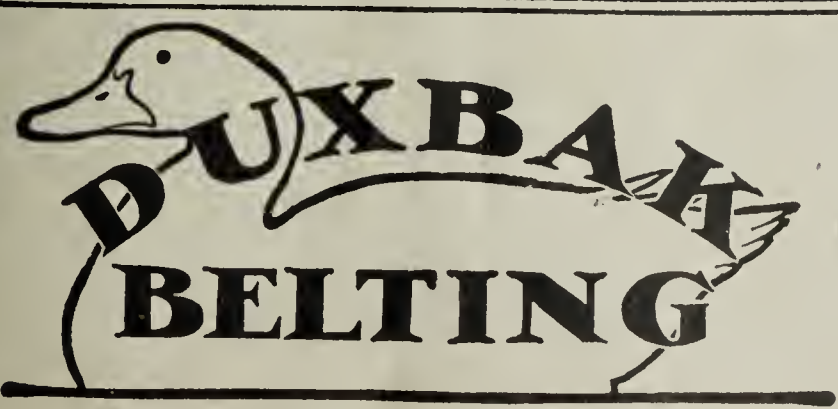
You have experimented with many waterproofing compounds containing "Stearates" or other Soaps. IMPERVITE is not a soap; it is the only compound which is an "Asphaltic Emulsion."
One pound of Impervite is better than two pounds of Soap Compound.



We can send you Official Government Tests and scores of enthusiastic letters from Users—but will this SATISFY you?
In order to give you an opportunity to PROVE our claims, we are willing to send you 25 pounds of Impervite for \$2.00 (freight prepaid by us) with the understanding that if it does not prove more efficient than the com-

pound you are now using, you will be under no obligation to pay us
We are willing to let YOU be the judge. Write today.

The Standard Paint Co.
NEW YORK BOSTON CHICAGO



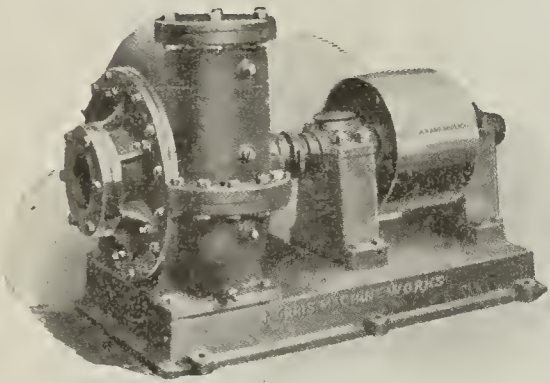
TRADE MARK

Chas. A. Schieren Company
ESTABLISHED 1868.

Tanners
Belt Makers
NEW YORK 30-38 Ferry St.
CHICAGO 128 W. Kinzie St.
PITTSBURGH 337 Second Ave.
DENVER 1752 Arapahoe St.
SEATTLE, 620 Fourth Ave.
The Texas Chas. A. Schieren Co., Inc., 106 S. Market St., Dallas, Texas
BOSTON 641-643 Atlantic Ave.
PHILADELPHIA 226 North 3rd St.

MORRIS

Solid Lined Dredging Pumps



EVERYTHING that enters into the construction of the Morris Solid Lined Dredging Pump is of heavy proportions and the general design is such that wear is reduced to the smallest possible extent. Its ability to outlast other dredging pumps is its chief claim to economy.

By removing the upper half of the pump shell, the lining can be taken out or by removing the disc on the pump shell and the inner disc on the lining, the runner can be taken out. The pump is easily and quickly taken apart if necessary to replace lining or piston.

*Write for Sand and
Gravel Pump Catalog*

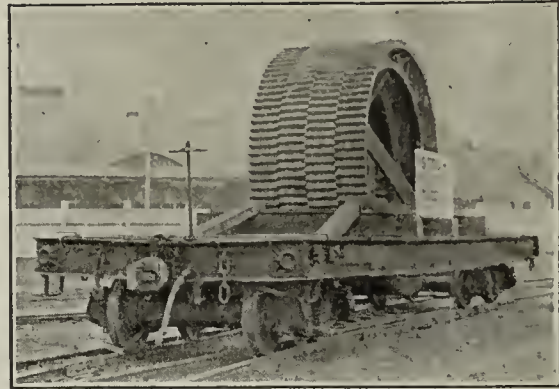
Morris Machine Works

Baldwinsville, N. Y.

NEW YORK OFFICE, 39 Cortlandt Street

HENION & HUBBELL, General Agts.
227 No. Jefferson St., Chicago

Stroh Process



First shipment of gears for Universal-Portland Cement Company's plant of Duluth which is being equipped with Stroh Process Gears and Pinions.

Pinions and Gears

Grinding Plates

Crushing Plates

Track Wheels

Sprockets

Sheaves

Liners

Mantles

Concaves

WEAR-PROOF - LOW PRICED



Trade Mark
Registered



Fracture of
Involute Tooth

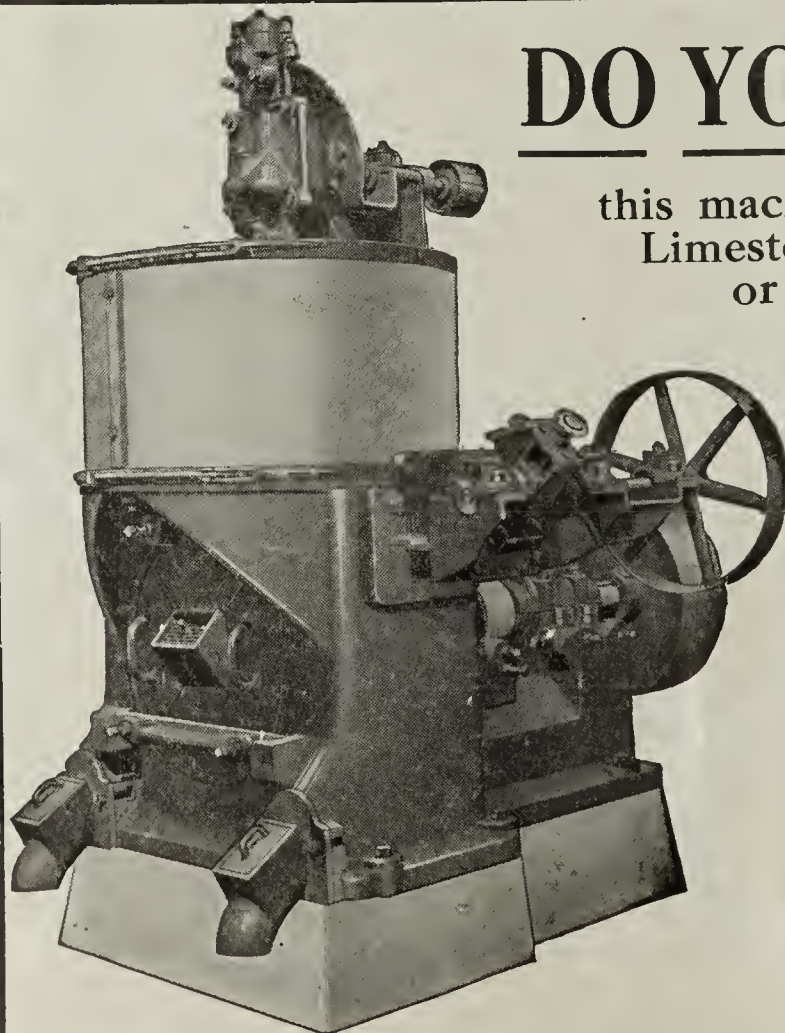
MADE EXCLUSIVELY BY

Kennedy-Stroh Corp.

PITTSBURGH, PA.

DO YOU KNOW

this machine will grind
Limestone, Clinker
or Coal and



FINISH IT AT ONE OPERATION?

6-8 Tons Limestone
12-15 Bbls. Cement
PER HOUR

SIMPLIFIES EQUIPMENT

The BONNOT CO.

CANTON, OHIO

909 New York Life Bldg.
KANSAS CITY - - MO.



Overlapping Drop Pan Carrier for Clinker, Cement, Earths, etc.



Apron Conveyor carrying on the level and up a steep incline.



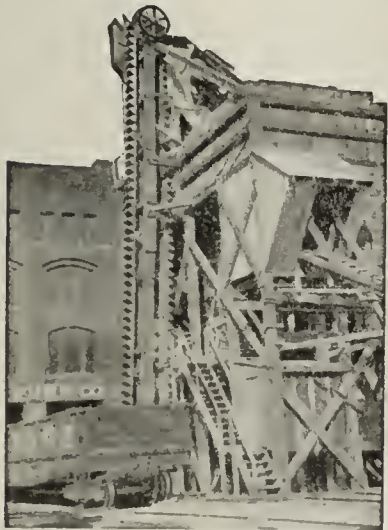
Pivoted Bucket Elevator-Conveyor for handling Coal, Ashes, Clinker and raw materials.



Jeffrey Belt Conveyors and Trippers are noted for their Simplicity, Reliability and Low Cost of Operation.



Crushed Stone Elevator of large capacity, showing 30-inch continuous buckets mounted upon double strands of "Hercules" Chain.



A 70-foot Continuous Bucket Elevator delivering 2 1/2 yards of crushed stone or sand per minute.

Get More Work Done with Less Cost and Labor

The JEFFREY LINE of Elevating, Conveying, Screening, Pulverizing, Crushing and Power Transmission MACHINERY

is the "Proved-In-Service" Line for Cement Mills, Sand and Gravel Plants, Quarries, Contractors, and Builders' Supply Dealers.

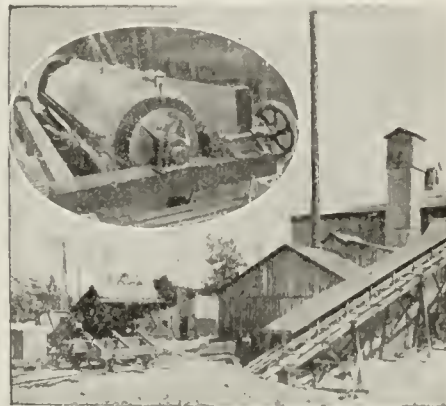
Before you decide on *New Equipment* or make repairs to your *Old Equipment*, write for our new *General Catalog No. 83-14*. It undoubtedly pictures the very outfit you need for increasing your output and reducing your operating cost.

Jeffrey Manufacturing Co.
914 No. Fourth Street, Columbus, O.

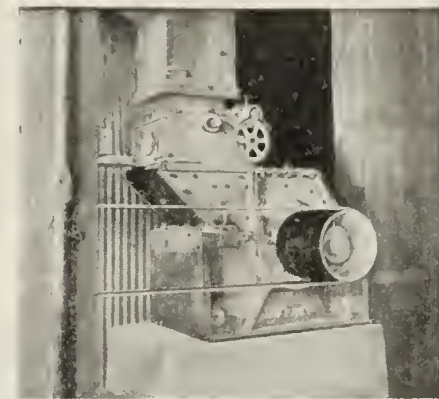
NEW YORK
BOSTON
PHILADELPHIA

PITTSBURGH
CHARLESTON, W. VA.
CHICAGO

BIRMINGHAM
DENVER
MONTREAL



A simple and economical Sand and Gravel Plant; the screen illustrated is fed by an inclined belt from a dump hopper in the gravel pit.



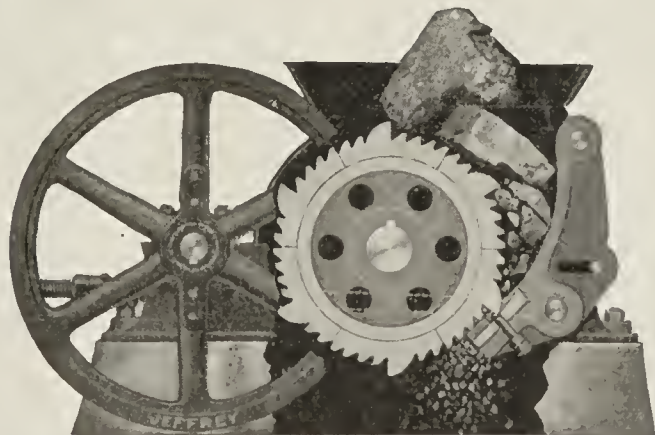
Type D Swing Hammer Pulverizer in operation at the Ohio State Quarry.



The Jeffrey Type A Pulverizer solves the Top Dressing Problem for Road Contractors.



Jeffrey Type A-14 Giant Loader handling crushed stone from storage pile to gondola cars of various heights.



The Jeffrey Single Roll Crusher reduces Run-of-Mine or Lump Coal to stoker sizes in a Single Operation.



This Bucket Elevator successfully handles sacks of Cement stacked on filled buckets of Sand and Gravel.

Power & Mining Machinery Co.
Kiln Supporting Frame

Our Standard Design

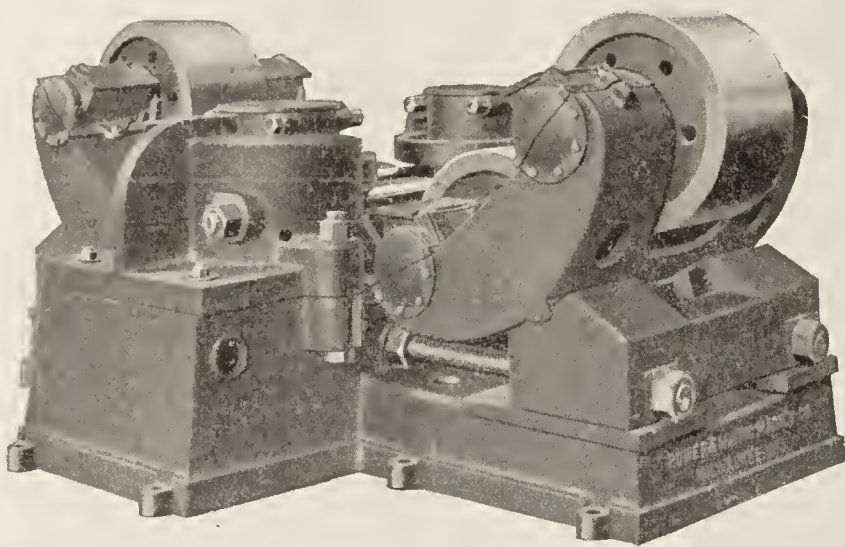
As built by us for the past eight years.

Twenty-five kilns ranging from 8' x 125' to 10' x 240' furnished to ONE CEMENT COMPANY, besides a large number of smaller installations.

This, as well as the universal approval of our design is proof THAT IT IS THE BEST.

We also build Dryers, Coolers, Gyratory and Jaw Crushers, Pan Conveyors, Screens, etc.

Send for Catalogue No 7-108.



Power & Mining Machinery Co.

Works, Cudahy, Wis. New York Office, 115 Broadway
 District Offices—Chicago, El Paso, San Francisco, Atlanta

M 311.2

**The Adjustment
 of
 Symons Disc Crusher**

The Disc Crusher takes the rejections, screened or unscreened from all types of preliminary breakers and a uniform product is obtained (through a wide range of sizes) by the quick and easy adjustment of the discs. This is accomplished by removing or inserting segment plates between the spider and spider plates.

Compensation for wear is also thus obtained and as the discs wear even and smooth they will practically last until completely worn out.

On account of this adjustment, it is possible to produce the required size of product as the occasion or season demands, no large storage capacity being required.

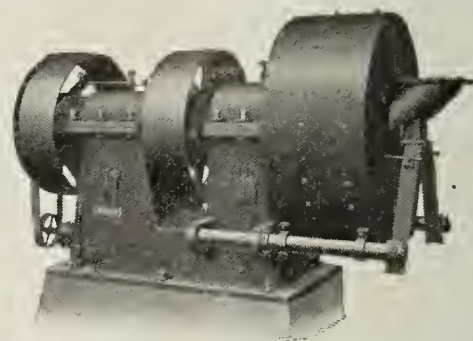
The dependability and large capacity of the Disc Crusher and the quick and easy adjustment of the discs are reasons which make the Disc Crusher so popular among its users.

Manufactured only by

CHALMERS & WILLIAMS

1457 Arnold Street, - - - Chicago Heights, Ill.

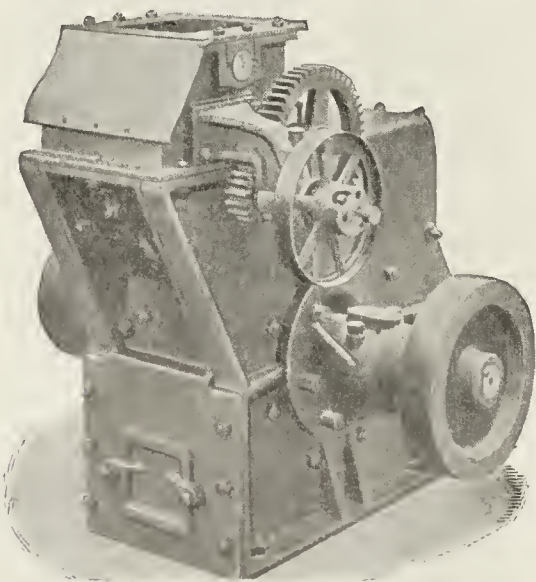
NEW YORK OFFICE, EQUITABLE BLDG.



Eventually Symons Discs

PULVERATORS

FOR PULVERIZING RAW MATERIALS



Any capacity, producing 50% to 65% of product through 200 Mesh Sieve, increasing tube mill output, fineness, and value of your product. Write for Bulletin No. 4028, describing Pulverators — pulverizing by a new principle.

Allis-Chalmers Manufacturing Company

MILWAUKEE, WISCONSIN

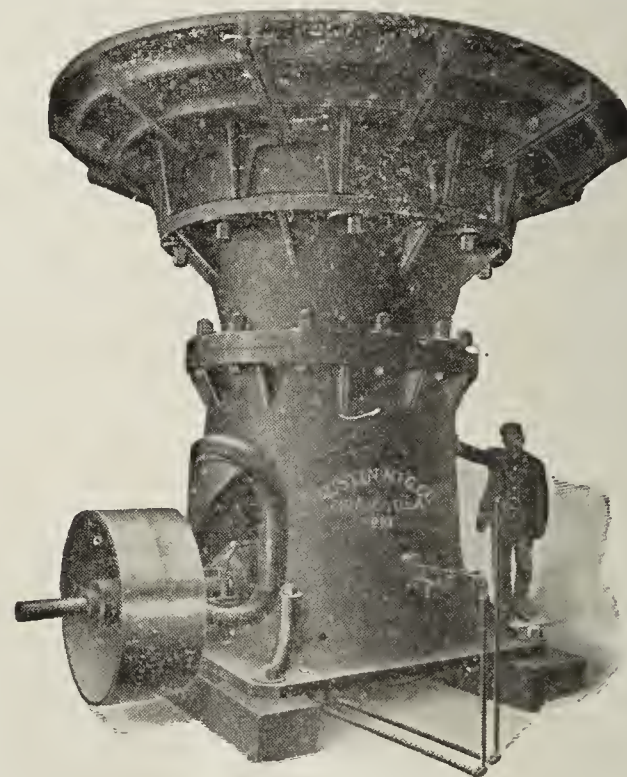
Offices in All Principal Cities

For Canadian Business refer to Canadian Allis-Chalmers, Limited, Toronto, Ontario, Canada

Foreign Representatives

Frank R. Perrot 833 Hay Street, Perth, West Australia
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 H. I. Keen, 732 Salisbury House, London Wall, E. C., London, England
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Austin Gyratory Crushers



The World's leading Ore and Rock Crusher. Its many superior qualities and mechanical advantages have won the highest reputation amongst Mining Engineers and Quarrymen.

Made in NINE sizes with capacities from 50 to 5000 tons per day. Smaller sizes can be mounted as Portable Plants. Thousands in use. Plans and specifications furnished for any size of Plant.

Austin Manufacturing Company

CHICAGO -:- NEW YORK

Canadian Agents—Mussens, Ltd., Montreal,
 Toronto Winnipeg Calgary Vancouver

Jones Superiority

Insure the successful operation of your plant
by installing

THE JONES

Line of Transmission Machinery

Is used by progressive manufacturers throughout the United States. We have our own foundry, machine shops, metal working department, pattern departments, etc, etc. We employ first-class help in all departments and use high-grade materials. When you are in need of anything in our line, try us. We manufacture a complete line of

POWER TRANSMITTING MACHINERY

Pulleys, Gears, Rope Sheaves, Friction Clutches, Belt Conveyors, Shafting, Conveyors, Sprocket Wheels, Gears, Hangers, Buckets.

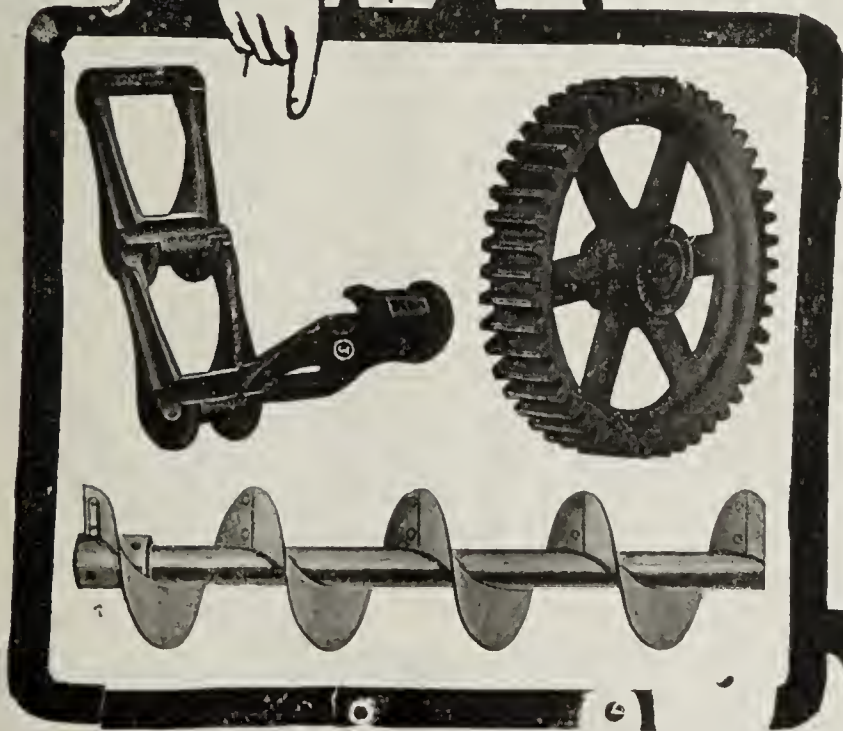


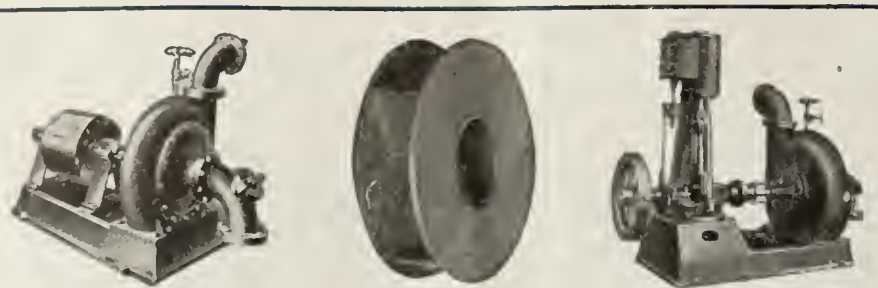
ALSO
ELEVATING
—
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MACHINERY

SERVICE

We have built up a reputation for quick shipments. Avail yourself of the JONES SERVICE. We can make shipments on some articles the day following receipt of order.

W. A. Jones Foundry & Mach. Co.
1412 West North Avenue
CHICAGO





SAND-GRAVEL DREDGING PUMPS

are our specialty. We build a full line of Standard Pumps for the most common requirements as well as a complete line for High Heads, either Motor Driven or Engine Driven.

Ask for Bulletin C-30. It Tells You More About Them.

ERIE PUMP AND EQUIPMENT CO.

Successors to the Erie Pump and Engine Works
Erie, Pa.



LUNKENHEIMER

BLOW-OFF VALVES

STRAIGHTWAY AND ANGLE PATTERNS

have a self-cleansing seat—the vital feature in a blow-off valve.

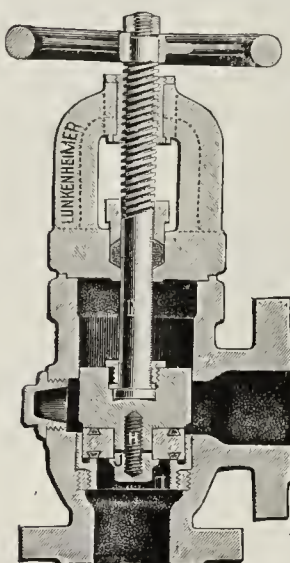
Passages are free and unobstructed.

All parts are easily renewable without breaking pipe connections.

Straightway Pattern made in **Bronze**, for 200 and 300 pounds working steam pressure, and in **Iron Body Bronze Mounted** for 125 and 175 pounds pressure.

Angle Pattern made in **Iron Body Bronze Mounted** for 125 and 250 pounds working steam pressure.

Ask your dealer for descriptive booklet or write for catalog.



THE LUNKENHEIMER CO.

—“QUALITY”—

Largest Manufacturers of
High Grade Engineering Specialties
in the World

CINCINNATI

New York

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“THE TWENTY-FIRST CENTURY BAG”

“VALVE BAGS”

THEY ARE THE BEST
FOR CEMENT, LIME,
PLASTER, ALCA,
GROUND STONE, ETC.

SAVE MONEY AND TIME BY USING THEM

They Are Easier to Handle and More Economical

The Strongest Paper Bag Made

BATES No. 1 ROPE VALVE BAG

(PATENTED)

Write us for Samples and Quotations



The Urschel-Bates Valve Bag Co.

TOLEDO, OHIO.

Manufacturers of
Open Mouth and Valve Bags

100
Years
Ahead of
All the Rest

JOIN THE ARMY

—of satisfied users of
Electric Furnace Steel Castings

It's a Self-Evident Fact that the Purer a Steel the Better Its Properties

The Superior Purity of Electric Furnace Steel Is Unquestionable

(See Iron Age, issue of April 23rd, 1914)

No oxides
No segregation

Low phosphorus
Low sulphur

High tensile strength
High elastic limit

Greatest resistance
to wear and fatigue

Castings of Special Analyses for Cement Mill Machinery

Give 50% to 100% additional service

Grinding Rings
Liner Plates

Yokes
Pushers

Griffin Mill Parts
Etc., Etc., Etc.

Grey Iron Castings from 1 Lb. to 35 Tons

Grate bars for all styles of dryers

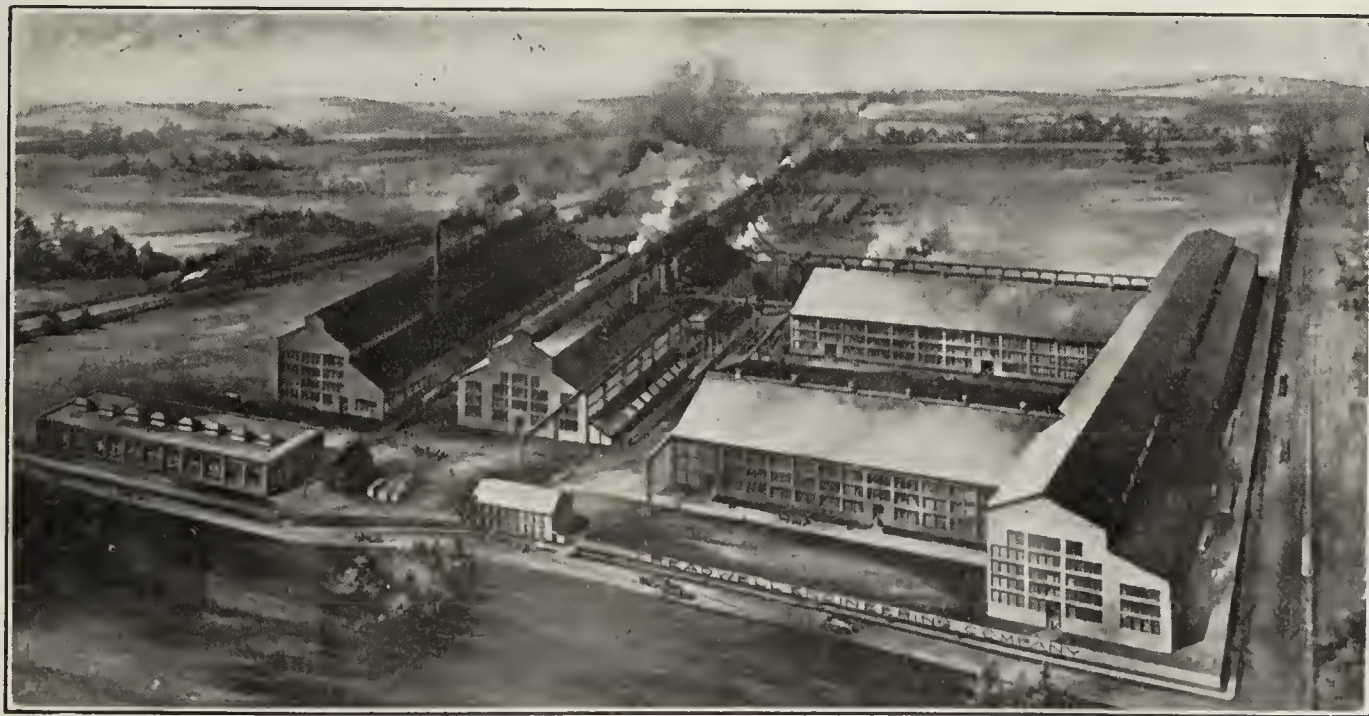
Rotary Kilns, Shale Dryers, and Grinding Mills

Power Transmission Machinery

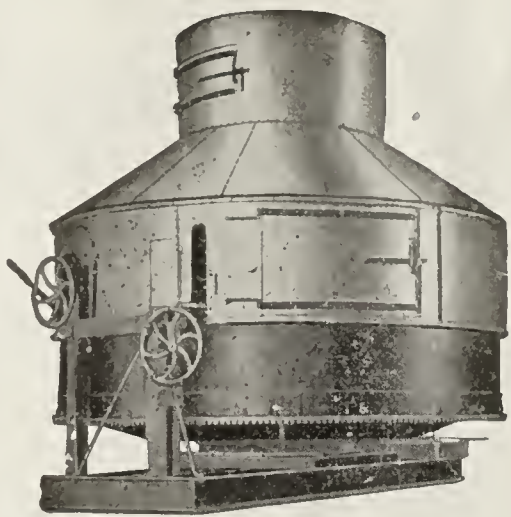
Gear drives, rope drives, etc.

Stoeber Pipe Threading and Cutting-Off Machines

Machinery Designed for Special Purposes



Treadwell Engineering Company, Easton, Pa., U. S. A.



Clyde Hydrator with Hood
"The Common Sense Way"

SIMPLICITY IS THE KEYNOTE OF SUCCESS

IT does not take a "master mind" to install a CLYDE Hydrating plant, nor does it take a "high priced" engineer to run one. If **YOU**, Mr. Lime Manufacturer, realized how simple it is to obtain a PERFECT HYDRATE, with the CLYDE HYDRATOR you would place your order with us by FIRST MAIL. Write us today—NOW, and let us explain to you what CLYDE PROCESS hydrated lime is and how to obtain the best results, then

Use your own judgment—it's up to you

H. MISCAMPBELL - Duluth, Minn.

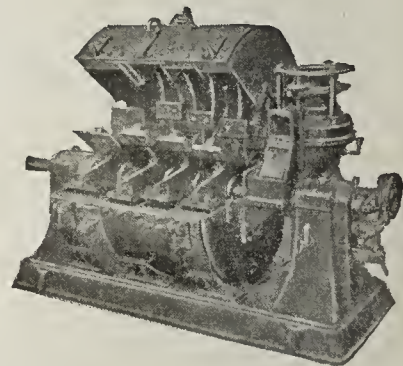
Patentee and Sole Manufacturer

BURN PULVERIZED COAL BY THE AERO SYSTEM

BECAUSE

1. It gets every available B. T. U. out of the coal.
2. Makes available slack coal and screenings at a fraction of the cost of mine run and lump coal and oil.
3. Eliminates the danger of fire or explosion from fuel in storage.

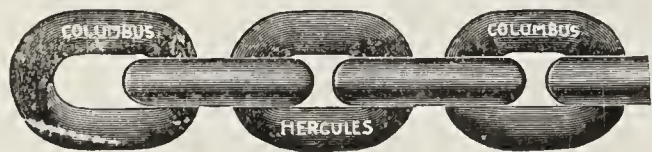
4. Both temperature and quality of flame accurately controllable at all times.
5. Construction prevents clogging by obstructions and guarantees continuous dependable action.
6. Perfect combustion is effected—No soot—no smoke, no free oxygen, no CO.



Shall We Send "Real Evidence"?

AERO PULVERIZER CO., 61 Broadway, NEW YORK

FOUND AT LAST "HERCULES" SOLID WELD STEAM SHOVEL CHAIN



The Chain that put the **SHOVE**
in Steam **SHOVELS**

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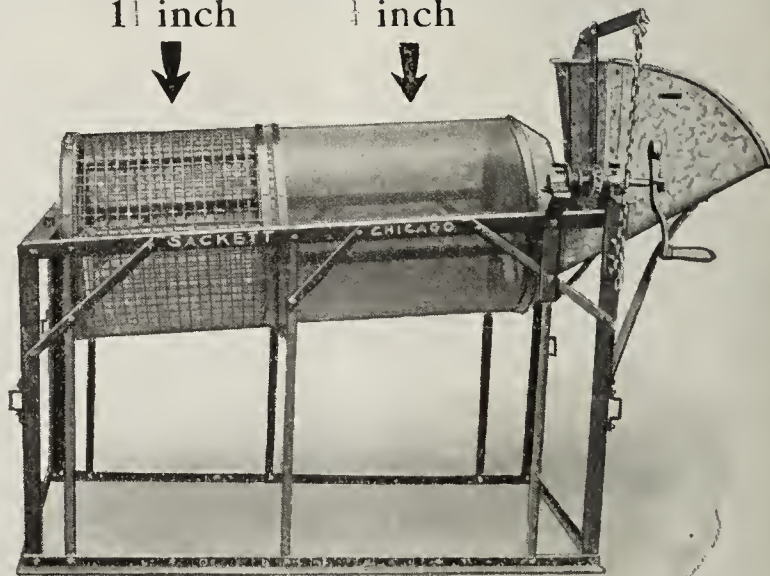
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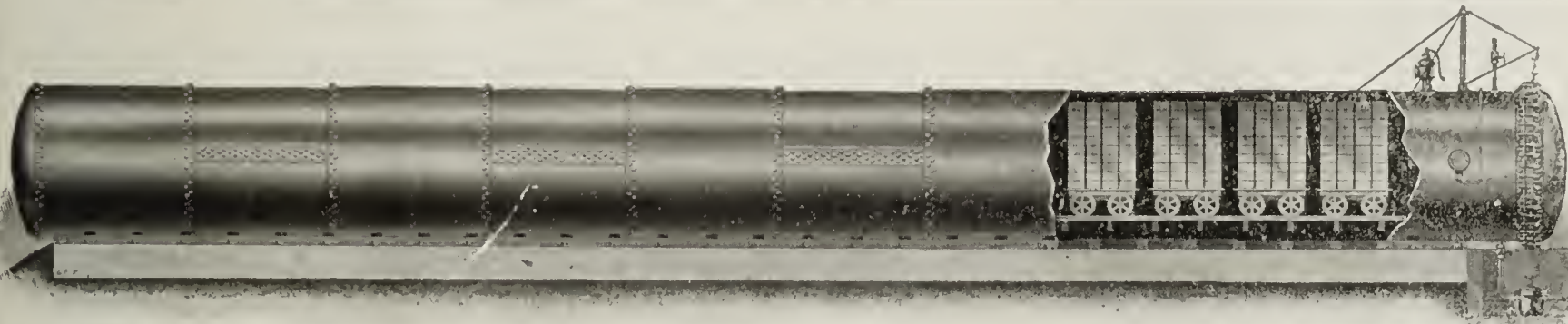
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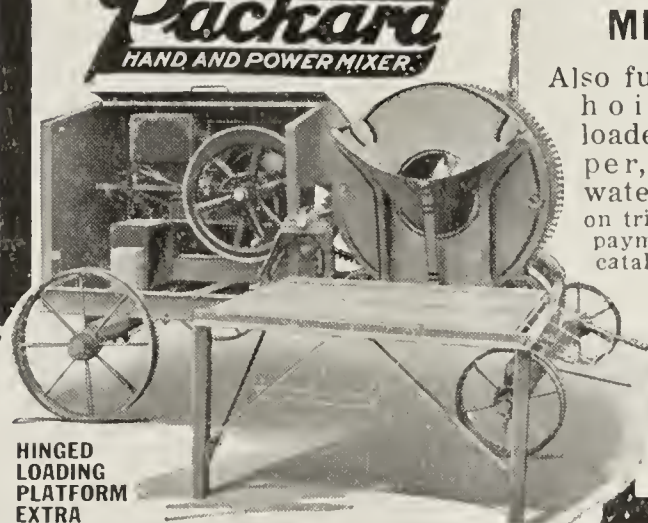
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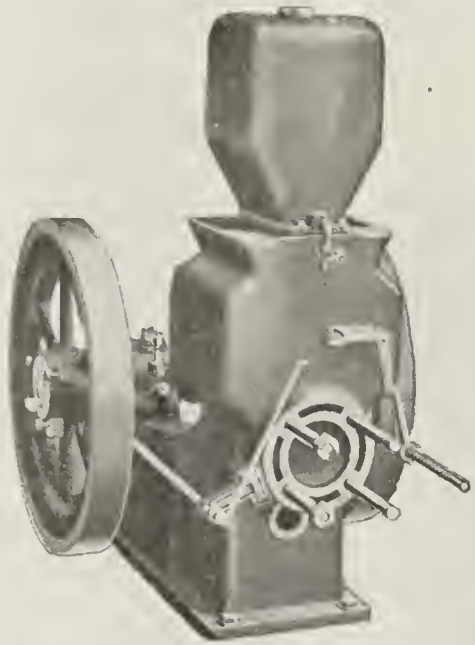
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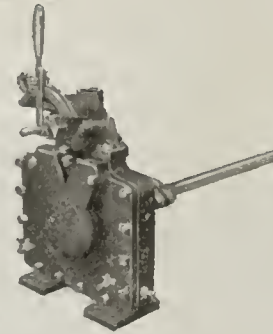
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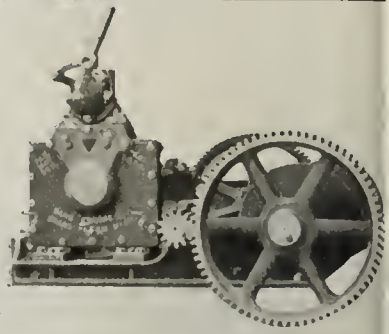


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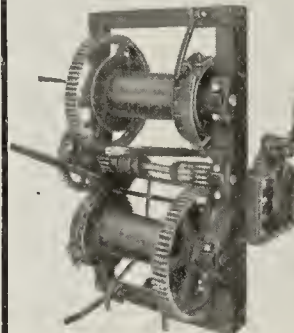
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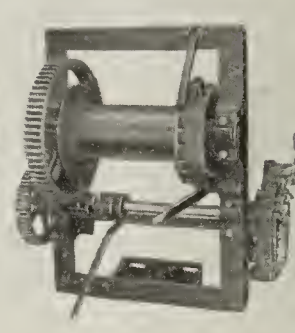
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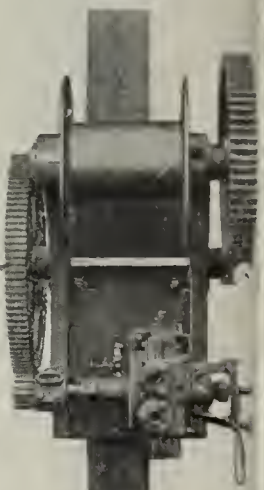
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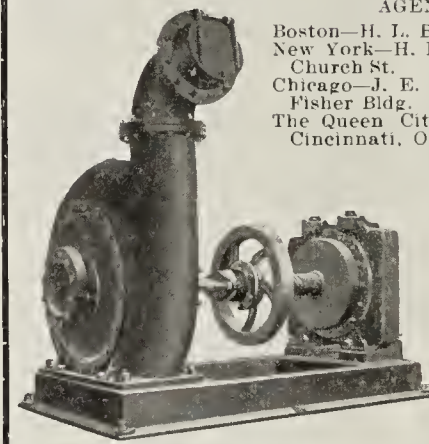
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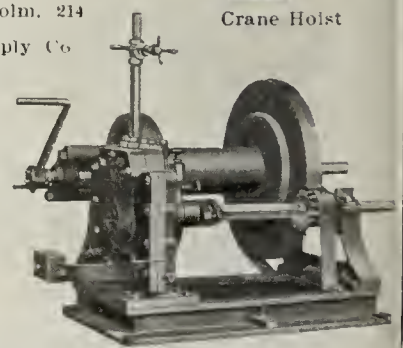
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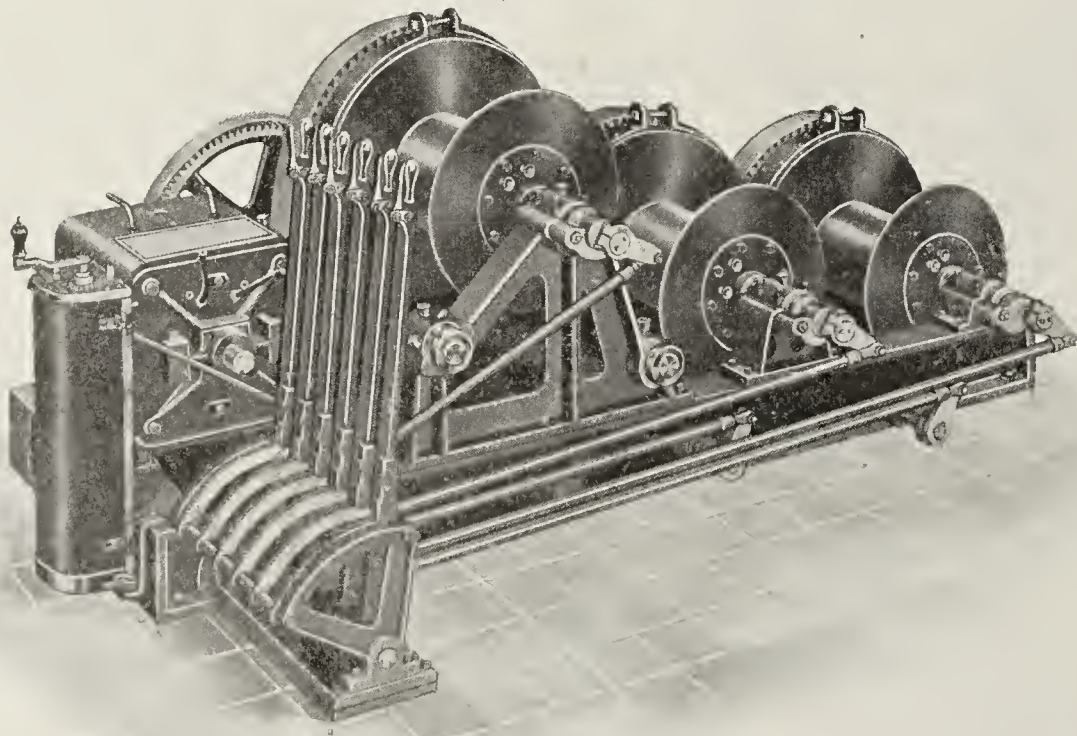


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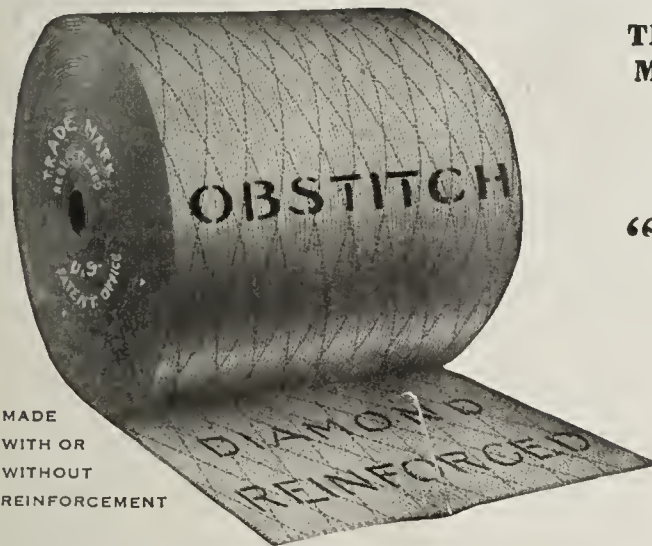
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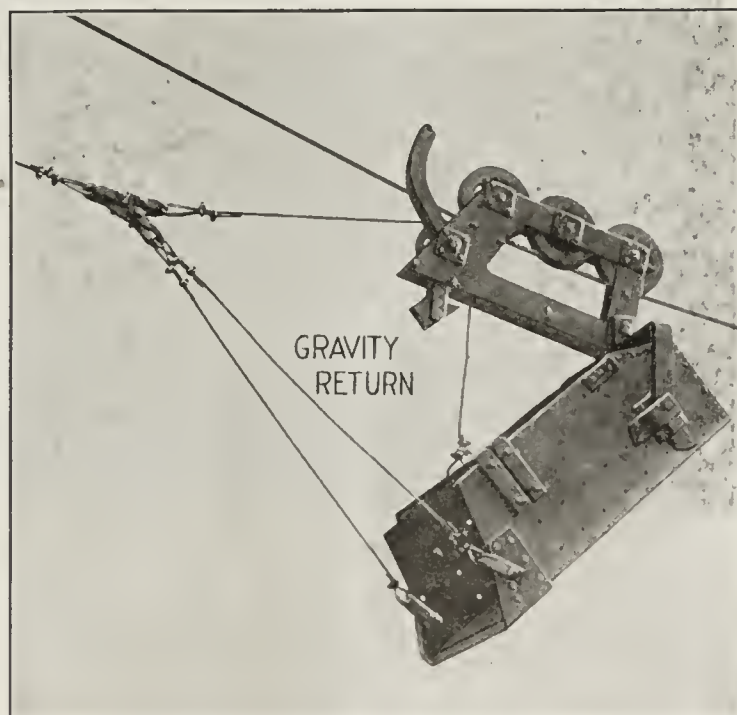
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CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

WILLIAM SEAFERT, Editor and Publisher

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CHICAGO, JUNE, 1915

NOTED EXPERTS INVESTIGATE RESULTS
OF EDISON FIRE—REPORT SHOWS FIRE-
RESISTIVE VALUE OF CONCRETE

With Cass Gilbert, architect of international reputation, designer of Minnesota state capitol at St. Paul and Woolworth building, New York, as chairman, the special committee of experts appointed by the American Concrete Institute made a thorough investigation of the results of the fire at the Thomas A. Edison, Inc., plant at West Orange, N. J. The committee report stated in part:

"The fire fully demonstrated the advantages of monolithic structures. The fact that at five different places several of the wall columns were rendered useless and yet the upper portions of the building stood intact is evidence of the superior merits of concrete in monolithic construction.

"Considering the extraordinary conditions surrounding this fire, the behavior of the concrete buildings was highly satisfactory and constitutes an excellent demonstration of the merits of concrete as a fire-resisting building material. It is not so surprising that the concrete buildings were damaged as that any material should have so satisfactorily withstood these unusual conditions.

"The end walls in the three upper floors of two buildings extended above the roofs of the adjoining buildings, which were completely destroyed; while this was in the hottest part of the fire, the walls were practically undamaged and are an admirable demonstration of the value of concrete walls as a fire barrier.

"The fused metal found in different parts of reinforced concrete buildings would seem to indicate that the fire reached an intensity of 1,000 degrees F. in all these buildings, and in many cases as high as 2,000 degrees F.

"In the greatest portion of these buildings the concrete remained firm and hard and intact after this severe heat treatment."

(Signed) Cass Gilbert, architect, New York, past president American Institute of Architects; E. J. Moore, chief engineer, Turner Construction Company, New York; Walter Cook, consulting architect, Board

of Estimate and Apportionment, New York, past president American Institute of Architects; James Knox Taylor, formerly supervising architect, United States Treasury Department, Washington; Rudolph P. Miller, formerly superintendent of buildings, Borough of Manhattan; William H. Ham, consulting engineer, Boston; Charles L. Norton, consulting engineer, professor of heat measurements, Massachusetts Institute of Technology, Boston; Richard L. Humphrey, consulting engineer, Philadelphia, past president American Concrete Institute.

The net loss in the concrete buildings is plainly stated in a paragraph from one of Thomas A. Edison's letters:

"The report of our engineers shows that 87 per cent of the reinforced buildings, which were subjected to a very intense heat, are in good condition, and of the machinery which they contain, about 85 per cent can be used, with small repairs. Buildings of other materials, together with contents, were entirely destroyed."

(Signed) THOMAS A. EDISON.

ADVANTAGES IN USE OF COMMERCIAL
HYDRATED LIME OVER ORDINARY
SLACKED LIME

By E. W. Lazell

Slaking Lime.—Every one is familiar with the fact that when quicklime is treated with water a violent action takes place, the lumps of lime break up, heat is generated, steam is given off and after the action is completed, a paste or putty remains—the ordinary lime putty used for mortar. The fact that quicklime has changed its form from dry lumps to a wet paste and that heat has been generated prove that a chemical reaction has taken place; or that quicklime has combined chemically with water. It is a scientific fact when any chemical change or reaction occurs exact amounts of the material are involved. In the chemical change which takes place when lime is quenched with water definite amounts of lime and water are involved; in slaking lime an exact amount of lime unites with an exact quantity of water, forming an exact amount of hydrated lime. If after the slaking only sufficient water is present to satisfy the calcium oxide (lime) then a dry powder will remain. This powder is hydrated lime and it differs from the original quicklime and from pulverized lime in its behavior towards water. When water is added to hydrated lime no heat is generated nor does the material slake, thus indicating that water has no further chemical action on the hydrate.*What is Hydrated Lime?*—Hydrated lime of commerce is the dry powder resulting from the treatment of lime with sufficient water to satisfy the chemical requirements of all the calcium oxide.*Necessity for Exact Proportions of Lime and Water.*—In the foregoing emphasis has been laid upon the fact that precise amounts of lime and water react chemically. In other words, 1 lb. of lime requires a certain definite amount of water to form a perfect hydrate. If too little water is used in quenching the lime in the process of manufacture the lime will be burned in slaking and free lime, or lime which is not combined with water, will be present in the hydrate, rendering the material unsound. Plaster made from such hydrated lime will later pop and pit, due to the gradual slaking of the free lime by the moisture present in the atmosphere. Further, mortar made from such unsound hydrate generally works tough and non-plastic. The free, uncombined lime when present to any considerable extent will dry out the mortar, rapidly decreasing its strength and causing it to crumble. Free lime in hydrated lime is a dangerous ingredient and one which will always give trouble.

If too much water is used in the preparation of hydrate the material will be damp and wet, rendering it difficult to handle.

Obsolete Methods of Manufacture.—In the past, three methods were used to produce hydrated lime:

(1) Small pieces of lime were placed in a basket and immersed in water for a few minutes, until slaking began, when they were withdrawn and placed in a heap in order to conserve the heat and prevent escape of the vapor; the material swelled, cracked and became reduced to a dry powder.

(2) Lumps of lime were placed in a heap and wet at intervals until the mass was equally moistened throughout. The slaking proceeded as in the first instance.

(3) Small pieces of lime were exposed to the air for a number of months and the lime absorbed both water and carbon dioxide from the atmosphere, falling to a dry powder. The powder consisted of dry sub-carbonate of lime, containing about 10% to 11% of water.

These three methods of dry-slaking lime were crude and unless the greatest care was exercised, the resulting product contained particles of unslaked lime. The hydrate produced by these methods was generally short and possessed poor sand-carrying capacity; in fact, hydrated lime made by any of the above methods was suitable for use in agriculture only and such hydrate should not be confounded with hydrated lime manufactured by modern methods.

Modern Methods of Manufacture.—The modern method of manufacturing hydrate depends upon the addition of a definite amount of water to a predetermined amount of lime. By no other method is it possible to produce a hydrate which will contain sufficient combined water to satisfy the demands of the calcium oxide (lime) present. It is of the utmost importance that all the calcium oxide be in combination with water, otherwise the hydrate will be unsound and unsuitable for building uses. That all the lime be satisfied with water will be insisted upon in any specifications which may be drawn for hydrated lime to be used in the building trade, and it is vital for each manufacturer to recognize that the formation of hydrated lime involves a chemical change requiring the presence of exact amounts of lime and water. Since the process is chemical, it requires the same careful supervision as any other chemical process, such as the manufacture of Portland cement. The production and use of hydrated lime have been more retarded by the manufacture of only partly hydrated lime than from all other causes. Any method of manufacturing hydrated lime continually to produce a perfect product must be based upon weighing the lime used and measuring the amount of water added.

Advantages of Hydrated Lime

(1) *From the Standpoint of the Manufacturer.*—One of the great difficulties in connection with the manufacture of lime is the perishable quality of the product. Lump lime cannot be stored for any length of time without deterioration, thus making the operation of the plant dependent upon the season and the whims of the weather. Kilns must be fired up, damped down or put out, according to the season of the year and the condition of the weather. This unevenness of operation results in a high unit cost. Since hydrated lime can be stored in bins in a manner similar to cement, it is possible to make the operation of the plant more nearly continuous, thereby introducing economies in the manufacture and reducing the cost. The manufacture of hydrate also means a more extended market, as hydrated lime can be used for a number of purposes for which quicklime is not suitable.

(2) *Advantages to the Dealer.*—Three principal advantages to the dealer are the ease in handling, less deterioration of the product and the freedom from fire risk. These three facts alone should convince the dealer that it is more economical to handle hydrated lime.

(3) *Uses of Hydrated Lime.*—In general it may be stated that hydrated lime is suitable for any use in the building trade to which lump lime can be put, and it would appear that as soon as the material comes into general use, its advantages will be found to far outweigh any disadvantages. The use of hydrated lime does away with the necessity of slaking lime to a paste, thus saving the space required for the slaking bed as well as the labor of slaking. By the use of hydrate it is possible to proportion the mortar so as to have exact quantities present since this form of lime comes into the market in convenient packages of known weight. This point is always appreciated by the architect and engineer, as it is a well known fact when lump lime is used, as much sand as possible is added with the result that the mortar is lean and possesses little strength. If hydrated lime is correctly manufactured and the particles of core removed by some process of separation, the resulting product will possess a higher grade of purity than the original lime from which it is made. The product will also be more uniform and these two facts appeal strongly to all users of lime.

Mortar made from Hydrate is Stronger than that made from Slaked Lime.—In June, 1910, the writer presented the results obtained from an extended series of tests on mortars made from both hydrated lime and lump lime to the Am. Soc. for Test. Mat. One of the most important conclusions drawn from these investigations was that the mortar produced from hydrated lime was stronger than that produced from the corresponding lump lime slaked to a paste. This conclusion was to be expected, since it is possible to manufacture hydrated lime by mechanical means under good chemical control, which is more thoroughly slaked than it is possible to slake lump lime on the job. With lump lime, the user is always dependent upon the thoroughness of slaking, and it is well known that unless the lime paste is run off and stored for some considerable time, there is no assurance of complete and thorough slaking.

Practically all those who have investigated the strength of lime mortars have recommended the use of hydrated lime in place of lump lime. In Bulletin No. 30 of the Bureau of Standards, the following statement is made: "The proportion of impurities in hydrated lime is generally less than in the lime from which it is made. In building operations hydrated lime may be used for any purpose in place of lump lime, with precisely similar results. The consumer must pay the freight on a large amount of water, but the time and labor required for the slaking are eliminated and there is no danger of spoiling it either by burning or incomplete slaking * * * For all building purposes hydrated lime is to be preferred to lump lime. By its use the time and labor involved in slaking may be saved and the experience of the laborer is eliminated as a factor in the problem."

If the use of hydrated lime in the building trade is to be increased, this can be brought about only by the manufacturers of hydrate preparing and marketing only such material as is sound and contains no free lime. There is an increasing demand for hydrate for use in concrete to render the material more plastic and dense. Hydrated lime can be advantageously used in all cement plaster and stucco to make them work smoothly and give a more pleasing color. In all these uses the soundness of the hydrate is the paramount requirement. No one would think of using unsound cement—why then, should they expect to use unsound hydrate?

The market for hydrated lime is present and a concerted action on the part of the lime manufacturers to exercise the care necessary to make a thoroughly hydrated lime will result in a more extended use of the material. It is to be hoped that the manufacturers will direct their energies along this line.

CONCRETE DAM

The recently completed dam on the Coosa River in Central Alabama, included the placing of more than 75,000 cubic yards of concrete, and it was constructed in the remarkably short time of less than eight months, under conditions that were far from being the most favorable for rapid work.

This work was done by the MacArthur Brothers Company of New York, Chicago, and San Francisco, for the Alabama Power Company, and the plant is the first of a number of hydro-electric developments contemplated in Alabama by the latter concern.

The Coosa River Dam, including power plant and the wing at each end, is approximately 1,650 feet in length, of which the spillway section is 930 feet between abutments. At the site of the plant the river is about 1,150 feet wide and has a flow ranging from 2,000 to 120,000 sec. ft. The dam is of the straight overflow gravity type, built of Cyclopean masonry.

One of the several unfavorable conditions of this

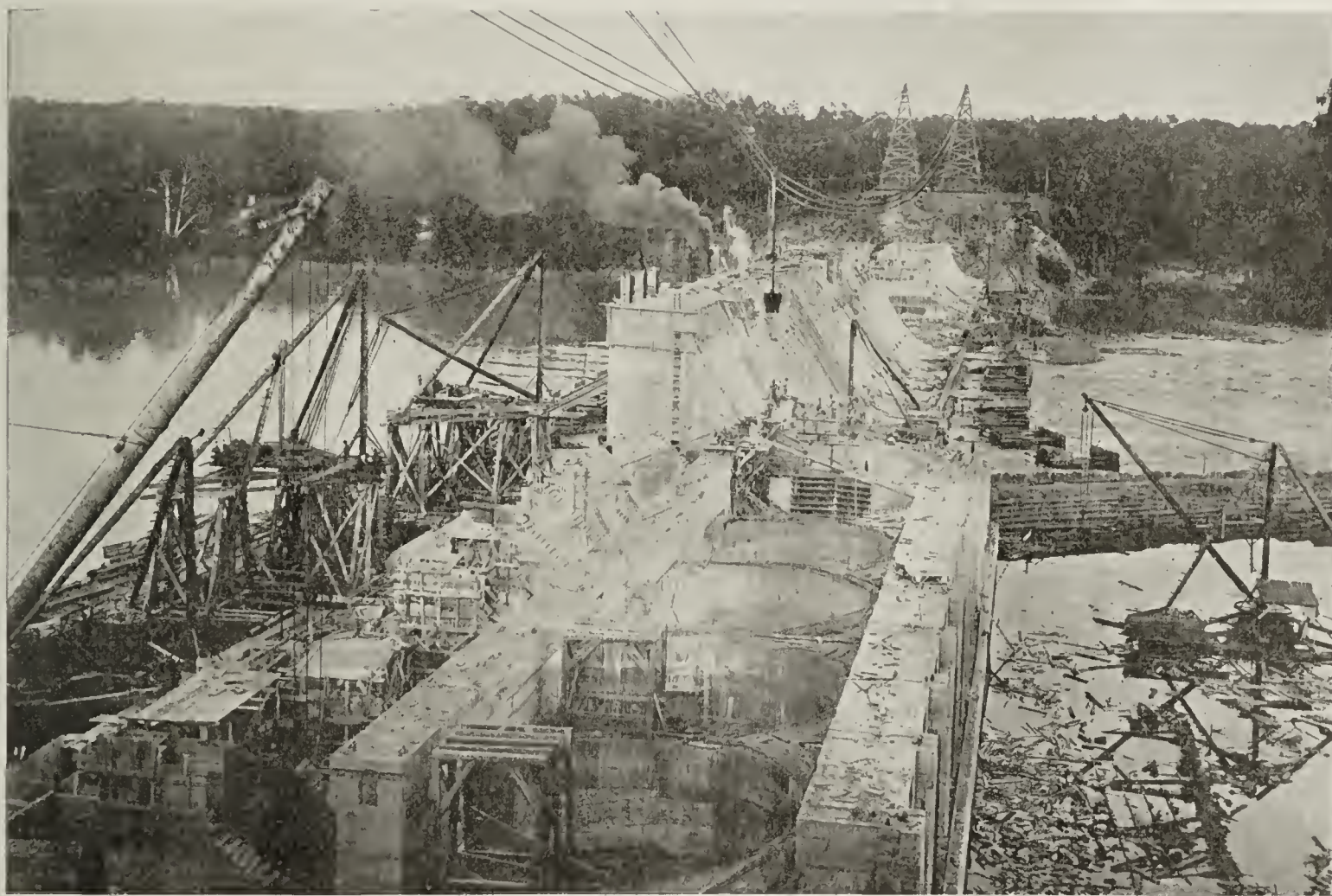
turbines selected for this installation are said to be the largest capacity turbines of their kind ever installed in this country, to operate under similar conditions.

Some idea of the importance of such a project can be gained from the fact that the power developed will replace the use of possibly 500,000 tons of coal a year. Current is being supplied to many towns and cities in the iron district and it is estimated that it will greatly benefit the steel and iron industry in Alabama.

The execution of this work was in charge of Mr. Geo. H. Penglase, Superintendent for the Contractor, and Mr. A. C. Polk was resident engineer for the Alabama Power Company.

THE VALUE OF THE TILE BUSINESS TO CONTRACTORS FOR CONCRETE WORK

Millions of dollars are paid annually by the American farmer for drain tile, and of this amount the clay interests receive by far the greater share. The failure



Constructing the Concrete Dam on the Coosa River.

work was that it was necessary to haul all sand, stone, and gravel for the concrete from eight to forty miles, and for the handling of this material five geared locomotives and nine rod engines were used.

From the concrete mixing plant, which was located on the west bank of the stream, material was delivered into 2½-yd. buckets on flat cars by which it was taken to the site of the work. For handling most of the concrete on this work, two Lidgerwood cableways of 1,660 ft. span were used. Each of these cableways was equipped with a 2¼-inch diameter Leschen Locked Wire Rope for track cable, and Patent Flattened Strand Wire Rope for hoisting and endless lines. Nine traveling stiffleg derricks were also used in the distribution of the cement.

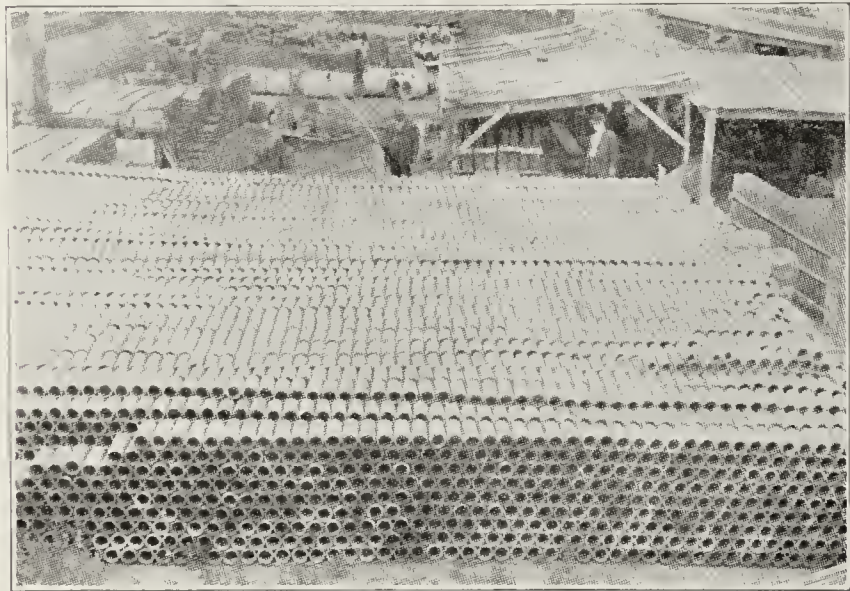
In one day's run of two shifts 2,240 cubic yards of concrete were mixed and placed. The largest single ten-hour run resulted in 1,287 cubic yards of concrete being mixed and placed. The power house of this plant has four units with provision for two more. Each unit has a capacity of 17,500 horse-power. The

of the concrete products manufacturers to make a stronger bid for the business can be attributed only to the fact that, as a business, the manufacture of cement tile is comparatively new, and consequently little known to the trade at present.

Between clay tile and cement tile the advantages are all in favor of the latter, particularly the advantages represented by *quality* and *price*. Clay tile may come from the machine with a perfect shape, but in burning and handling they in nearly all cases become warped and out of shape, rendering their efficiency a matter of question. With cement tile it is different. Properly made cement tile have ends of a true circle, free from all possibility of becoming warped or forced out of shape, and retain their perfect condition indefinitely. On the question of durability, too, there can be no two opinions; the greater strength of cement tile having been demonstrated time and time again.

It is usual to be skeptical of any statement claiming a combination of higher quality with lower price, but in regard to cement tile the statement is true beyond

question. Natural conditions make this possible. The manufacture of clay tile is neither a small business nor a local business; it requires a huge investment for machines, kilns, etc., all of which necessitates operations on a large scale. To this extent the product must be sold over a large territory; consequently through jobbers and dealers. The ultimate consumer—the farmer—is thus called upon to pay at least three profits (manufacturer, jobber and dealer), besides paying the cost of hauling and cost of breakage. In other words, if the initial costs of manufacturing clay and cement tile are the same, the clay tile man is handicapped by having to pay two extra profits, carrying costs, and meet losses due to breakage in transit.



Cement Tile Plant of Joy & Son, Napanee, Ont.

The manufacture of cement tile is a small business and a local business. By "small" we mean it can be started on a small investment. By applying the facts outlined in the preceding paragraph it can be realized how the cement tile manufacturer can *make* cement tile cheaper than local dealers can *buy* clay tile, and while it is not necessary to cut prices in order to sell cement tile, it is an excellent weapon for times of emergency.

While the tile business is open to anybody, those already established in the manufacture of concrete products can enter the tile business on a comparatively low investment for equipment. It will, of course, be necessary to buy a tile machine and necessary casings for making the different sized tile, but such accessories as a concrete mixer, gasoline engine, etc., are part of almost every contractor's present equipment. The prices of machines vary, according to its size and style, but expert opinion favors a machine capable of turning out from 1,500 to 2,000 tile daily. Certain machines are equipped with packer heads which go through each tile twice, the upward stroke coring out the center and the downward stroke troweling the inside walls and finishing the ends; this style of machine is probably the most suitable to use.

Another point in favor of the man already in business is that he has an established trade and reputation. It is a conservative statement to say that the bare announcement of being in a position to furnish cement tile will result in the sale of a manufacturer's entire output. This is because farmers are fully aware of the superiority of cement tile, and has been amply demonstrated by many men now in the business.

It is interesting to quote instances of actual successes with cement tile, and while space does not permit mention of many, we are glad to point out two typical cases from among our readers. In cut No. 1 we show the tile plant of Mr. P. A. Quamstrong of

Genoa, Ill., whose experience is representative of what hundreds of other men are doing.

During the recent Chicago Cement Show Mr. Quamstrong was asked what reasons induced him to get into the tile business and what results he had achieved. His reply follows:

"It was at the Cement Show of 1913 that the idea of entering into the manufacture of cement tile took definite form. Previous to that time I had, in connection with my other contracting interests, been putting up cement silos. Of course, the season for this work was not long. With the idea, in part, of keeping my men busy the year around, and because my investigation showed a good demand for drain tile in my locality, I installed a Dunn No. 1 tile machine that spring. Directing my efforts to the production of only first-class tile, I soon worked up a very good business and sold to the fall trade in 1913 over 100,000 tile. Anticipating a good demand for the following spring, I aimed to have at least that number in stock for the early spring trade (1914). However, my plant operated continuously through last year with the Dunn No. 1 machine, and late in the fall I had practically no stock.

"In preparation for this year's business I have installed a Dunn automatic tile machine, and while I am operating the tile plant with only two men, the production is at the rate of 2,400 tile per day. I will shortly increase the number of operators and, of course, will get the corresponding increase in output. When I started into the tile business I had some clay tile competition; it was here that the quality of my tile was shown, and I have sold them at even higher prices than local dealers get for clay tile."

The other illustration shows the plant of Joy & Son, Napanee, Ont., who remarked:

"We started the first Dunn tile machine in our plant in November, 1910, and the second one in June, 1913, and have been manufacturing tile continuously, and if the demand continues—as it has every appearance of doing—we will want another machine this coming spring. The farmers are using cement tile in this vicinity almost exclusively, the clay tile plant having



Cement Tile Plant of P. A. Quamstrong, Genoa, Ill.

gone out of business. We charge \$40 per thousand for our 6-inch tile, making them at the rate of 1,500 each machine per day, with two men to each machine. We have received many compliments on the quality of tile we turn out, and the farmers much prefer our tile to clay. We have received one order for 70,000 4-inch tile and orders for 30,000 other sizes."

Detailed information on the tile business will be gladly sent free upon request by the W. E. Dunn Manufacturing Company, 4139 Fillmore street, Chicago.

CEMENT DRAIN TILE; ADVERTISING AND SALES PROMOTION*

By J. J. Commons

"In order to get a comprehensive idea of the different advertising schemes and sales plans employed by concrete pipe makers, and with the object in view of combining the good points of the different plans and schemes used to promote the sale and use of concrete tile, a general letter was sent to 300 manufacturers in the states of Indiana, Illinois, Iowa, Wisconsin and Minnesota.

"While it was not my idea that all the clever sales and advertising ideas would be found in these states, and none in other states in which the concrete pipe industry is profitable, I felt reasonably sure of securing enough information, and samples of advertising used by the different manufacturers, to form the basis of an article of general interest to the industry.

vantageously used. A great many manufacturers have been using small newspaper space, but very few of the samples received indicate that any great thought has been given to the preparation of copy, or that the printer had made any effort to give the advertiser good display. In fact, very few newspaper ads were more than card announcements; i. e., simply the name of the manufacturer and the words "concrete pipe, blocks, etc." Newspaper advertising of this kind is of little value, unless, possibly, the advertiser considers it good policy to patronize his home paper, with the hope of getting some favorable notice concerning the operation of his plant, award of contract, etc.

"With the exception of personal contact advertising, I would say that on account of the general lack of office equipment necessary for handling advertising matter of any kind, the best medium for the average tile man is his local newspaper. Good, straight-to-the-



Fort Dodge Portland Cement Company Quarry, Gilmore City, Iowa, Showing Steam Shovel, Big Blast Hole Drills, Western Dump Cars and Track Arrangement. This Quarry Supplies One of the Largest Crusher Plants in the State.

"A careful analysis of approximately 200 replies to the letter, which requested an outline of sales and advertising plans of the cement pipe companies, has shown that very few manufacturers are making any systematic effort to create a demand for concrete pipe in general, or for any make of pipe in particular. On the other hand, some of the samples of advertising submitted by certain manufacturers were excellent, and in practically every instance, with the samples of good advertising matter submitted, was the statement that sales had been very satisfactory and no great trouble experienced in meeting the competition of other kinds of pipe.

"The majority of manufacturers who replied to my letter said they realized the necessity of advertising and the need of a businesslike plan of selling, but there was a general complaint of lack of ability to prepare advertising matter which could be profitably and ad-

point "reason why" copy should be written, and the printer should be made to understand that the ads should be properly set. True, the average tile maker is not an ad writer, nor does he understand how to specify type faces and sizes in order to get proper display, yet I believe if any tile maker, especially in the small towns, would go to his editor or the business manager of his local paper and contract for a space every week, in size, say, two columns wide by six inches deep, by so doing he could get assistance in preparing a good, businesslike advertisement.

"Whether the manufacturer has ability to write an advertisement or not, he at least should be able to advance some reasons for the selection of concrete pipe in preference to clay tile, and some reason for the selection of his product in preference to that of a competitor. By giving such information to his newspaper man he could surely get some assistance in pre-

paring advertising. A newspaper man is generally a booster for his town industries, and for this reason should be entirely willing to assist a young industry to the extent of helping prepare display advertising. However, a suggestion of this kind is for the extreme case, and an expedient which should not have to be resorted to too often.

"If newspaper advertising is used, it should be changed frequently, both as to display and reading matter. The same arguments used with different wording and different headlines and different style of setting would lend variety to the ad to give it greater chances of being read, besides imparting a certain up-to-dateness to the advertiser.

"I feel constrained to recommend, especially to the man who does not feel competent to write a good advertisement, the selling assistance offered by certain manufacturers of blocks and tile machinery. These machinery companies have prepared some very excellent helps for tile and block makers, and I believe this assistance is offered free to block and tile men who use their machines. And, even though I did not use their machines, I think I would not hesitate to request their assistance, if I could not get it elsewhere.

"Another form of advertising which has been largely used is small folders of four pages, suitable in size for enclosing in an ordinary envelope. While it is impossible, on a folder of this size, to give every reason why cement tile is good and should be used in preference to clay tile, such a folder may be advantageously used as a curiosity arouser or as an introduction between manufacturer and consumer. Such leaflets could be prepared at small cost in any print shop, and any tile maker could secure a list of names of prospective customers for his product, so that, to circularize every farmer within a reasonable radius of his tile plant would not be an expensive matter.

"One, two and even three color mailing cards have also been used to a certain extent. Such cards as were submitted were, as a rule, devoted to testimonials from satisfied users, with now and then a picture of a plant, or of an important job.

"Many tile makers have printed price cards. These are good. If you are not ashamed of your prices, quote them openly. Don't imagine that you gain any advantage by keeping your prices concealed. If your competitor wants to know your prices, he can easily learn them. Be sure you have the right price, and tell a customer, quickly and frankly, what your prices are when he asks you.

"It is not to be understood that any manufacturer can offset the efforts of the clay tile interests and create a big demand for the sale of cement tile by mailing one small piece of advertising. On the other hand, it is the persistent, systematic effort that wins in advertising, and frequent advertising efforts, backed up by reliable tile and the right price, will get the business.

"You must create confidence in your ability to make good tile—you must convince your customers and prospective customers that the tile you offer is as good as you say it is, and leave no room for disappointment on account of poor quality, if you expect to reap the benefits of the cumulative effect of advertising."

The paper was as fully discussed as any of the subjects so far taken up, showing that manufacturers are vitally interested in developing efficient methods for getting their product onto the market.

The use in advertising matter of data on tests was suggested by P. H. Atwood, showing that in a large majority of cases concrete pipe passes a better average test than clay. He thought also that manufacturers ought to make their pipe according to the specifications of the American Society for Testing Materials

and then advertise the fact that their product was being so made.

One member for Minnesota said that in his part of the country tile layers are boosting clay tile. C. D. Rant Jones of Perry, Iowa, said that his experience was just the opposite, and that all concerned like the concrete product better when they find out its advantages of uniformity of size and shape.

John L. Zeidler of St. Joseph, Mo., was convinced that the proper way to work, at least so far as sewer pipe was concerned, was with the engineers, giving them so straight quality talk based on the tests which concrete has passed and the experience of a large number of successful sewer installations.

Richard L. Humphrey, past president of the American Concrete Institute, was present and spoke interestingly on the topic. He said that there are three main elements in salesmanship—personality, quality and price. Of the three, he put special emphasis on quality. He said there is no question but that concrete pipe will exceed the strength of clay. Poor quality must inevitably react on the manufacturer and the entire industry, he said, stating that the poor quality of the first tile made, like the poor quality of the first dry tamp blocks, had worked incalculable injury, but that the tile business was recovering from this, just as the block business was being developed along new and more intelligent lines. He urged the adoption of specifications by the association which would give the members something to work to and place the organization on record as favoring the very best quality of product.

W. A. Collings of Kansas City suggested that the testimony in noted Kansas City controversy be put in shape to send out to the members so that they could use it as a basis for sales talks.

J. H. Libberton thought that in the matter of advertising the small newspaper card is of little value and that space in which one could really tell something should be used. He also suggested the cooperation of cement and machinery manufacturers in the preparation of publicity matter.

G. F. Lille of Fremont, Neb., told of how an influential man in his local city, who was opposed to concrete tile, was converted by being asked to make an investigation of some tile which had been dug up in perfect condition from alkali soil. This man then kept the specimens in his store and worked for concrete thereafter.

MEASURING GRAVEL IN PILES.

In purchasing, selling, and excavating gravel, there seems to be a growing tendency among contractors, public officials, and others to have the gravel measured in the pile as soon as convenient after it has been excavated. The immediate measurement enables the parties to know the approximate quantity so that they can arrive at an immediate settlement, and the gravel can be hauled away without the trouble of keeping account of the number of loads.

The greater number of these piles are taken from wet pits and located on comparatively level ground. The usual method of excavating is by means of an endless chain or dredge, and the manner of excavating has much to do with the shape of the pile. The more regular the pile, the more easy it is to measure accurately.

Probably no two engineers use exactly the same method in measuring gravel piles, nor are any two piles exactly the same shape. Before attempting to measure a pile, I view it carefully and determine what mathematical figure it most nearly approaches, or can be made to approach by cutting the same into sections. Where the sides of the pile have a very steep incline

so that the taking of horizontal and vertical measurements would be difficult, I usually take the angle of inclination of the sides at the base, and the distance up the incline, from which the horizontal and vertical distances can be computed trigonometrically.

Some piles will most nearly approach a cone, usually with an elliptical base, the area of which can be obtained by getting the major and minor axes. The quantity can be calculated by cutting the pile into quarters, taking the angle of inclination and the slant height from all four sides, and then computing trigonometrically the horizontal and vertical distances. The sums of the horizontal distance obtained from opposite sides will give each axis. The average of all four vertical heights will give the average height of the cone, at the same time taking into consideration the difference that may be in the level of the ground at all four points of the base.

If the pile should take the shape of a frustum of a

The end sections can be calculated as half the frustum of a cone with an elliptical base, one axis of which will be the bottom width of the end cross-section, and the half of the other axis will be the horizontal distance from the end cross-section to the extreme end of the pile at the base, running in the same direction as the main axis. The method of obtaining the cubical contents of these end half-cones will be the same as in the first case described.

If the pile be low and spread out over considerable ground so that the horizontal distances can be easily measured, it may be cut vertically into squares, say 10 feet each way if very irregular, or 20 feet if regular. The elevation of each corner of the squares, as well as the elevation of the ground at the base, should be taken by a leveling instrument. The average elevation of the ground at the base should be obtained by taking elevations at equal distances around the base in such a manner as to average the high and low points



Manufacturing Concrete Pipe with Hand Molds, Made by the Lansing Company.

me, set a stake in the middle of the top, so that the highest point will be the vertex; and calculate as before, taking the extended volume from the result. If the pile has curved sides from top to bottom, it will be necessary to cut it into sections (parallel to the average level of the base), and calculate each section as obtained either as a separate frustum of a cone or a prismoid, using the prismoidal formula.

The most general form of pile is oblong, with steep sides curved from top to bottom, coming so nearly to an apex as to be easily extended, and having elliptical ends. My usual method in measuring such a pile is to cut off each end by a vertical plane at right angles to the main axis of the pile; then divide the remaining middle portion into three (or some multiple of three) sections (depending on the regularity of the pile), by vertical planes at right angles to the main axis of the pile, so that, when the area of each cross-section is obtained, the entire middle portion can be calculated as one or more prismoids.

To get the area of each cross-section, take the angle of inclination and the distance up the incline for each course in going up the pile from the base to the top, the end of each course being so taken as to correspond to the greatest break in the slope of the side of the pile; and from the data thus obtained, the horizontal and vertical distances can be computed trigonometrically, and the sections divided into triangles and trapezoids, and the area obtained.

as nearly as possible. The average level of the base thus obtained, taken from the average level of all four corners of each square, will give the vertical height of the prismoid whose end is that particular square. From these data the cubical contents of each prismoid, and the cubical contents of the entire pile, can be computed—Oliver Clark, in *Engineering News*.

THE MANUFACTURE OF CONCRETE PIPE A PROFITABLE BUSINESS

The cement industry has grown to such an extent that nearly all branches of this industry are taking an important part in the development of the country. One of these businesses is the manufacture of cement pipe both for drainage, water supply, sewage, etc.

This industry is increasing with great strides and a demand for good concrete pipe is causing clay manufacturers to look on the use of concrete pipe with envy, as that business is on the increase while clay products are on the decrease.

The great advantage of this business is the small capital required to establish a good profitable business.

A few molds and a place to make the pipe are all that are necessary.

Concrete pipes have the advantage of not requiring great stocks made up in advance, as they can be handled within a couple of weeks and the expenditure

for molds is very small and this business therefore offers great possibilities both as a saving business or as an addition to cement block or concrete plant.

One of the most profitable and successful molds in use are those made by the Lansing Company, whose molds have been used for putting in over 500 miles of pipe in the city of Mexico, 300 in Brooklyn, 300 in Milwaukee, 100 or more in Denver and are largely used by United States Government for the large irrigation projects in the West.

Thousands of small plants are using this equipment and making money. The above view shows an ordinary pipe making plant. In fact the men are making the pipe outside while they build their factory as they find time and means. Each reports good business and success with these forms.

In addition to hand molds they manufacture power drain tile machines, and we would recommend our readers to write the Lansing Company, Lansing, Michigan, for information on this splendid paying business. Ask for catalog No. 354.

REINFORCED CONCRETE WAREHOUSE

The erection of six large concrete warehouses and manufacturing buildings at its various works in this country and Canada has demonstrated to the satisfaction of the International Harvester Company of New Jersey that reinforced concrete of proper design and construction is not only safe, but possesses many advantages in strength, rapidity of construction, fire-proof qualities and cost.

The company has recently completed an excellent structure at its McCormick works, Chicago, a seven-story and basement warehouse with a tower of twelve stories and basement. Plans were made by the construction department of the owner, and the engineering design by Uffendell & Holmes, architects, Chicago. The building is of reinforced concrete throughout, except that structural steel was used as reinforcement in the supporting columns for the tower, which rises five stories above the main building to a total height of 195 feet above the basement floor. A modified girder and joist construction was chosen.

The building is triangular in form, 306 feet long by 161 feet at the wide end, and only 22 feet wide at the narrow end, making unequal bays and more or less difficult column and beam connections. No changes were required in the original design, however, to conform to city ordinances, and during the progress of the work no alterations were found necessary.

The building rests on solid rock, caissons being sunk to a depth of about 17 feet below the basement floor level to accomplish this purpose.

The bulk of the concrete was poured in freezing weather, from November 15 to March 15, with little difficulty or additional expense. Great care, however, was exercised to protect the work from injury. A shed was constructed over the sand and gravel, which was heated by means of perforated steam pipes, attached to steamhose, the pipes being shoved down into the piles of sand and gravel. By this means and the use of hot water, the concrete went into the building at such a temperature that initial hardening was obtained before freezing could occur. The additional precaution was taken of covering the fresh concrete with canvas.

The reinforcement consists of twisted steel bars, bent wire stirrups and column spirals with the Gray type of structural steel for reinforcement in the tower columns. The typical girders are of T-beam shape.

There were used approximately 17,000 barrels of Universal Portland cement, 9,000 yards of gravel and 4,500 yards of torpedo sand.

The floor tests made by the engineer of the Chicago Building Department were very satisfactory. Two adjoining panels, designed for a live load of 300 pounds making a floor space 19 feet wide by 38 feet long, were loaded with 500,320 pounds of pig iron, equivalent to a dead load of 701 pounds per square foot. The maximum deflection shown on any of the girders was 3-32 of an inch, and one the panels of 9-32 of an inch.

The main feature of the building is the tower built to house sprinkler tanks of sufficient capacity to supply the entire McCormick works. This tower, nearly 60 feet square, is supported by 16 columns, with an elevator running to the eleventh floor. The four lower stories are a part of the storage warehouse. The upper stories are high, 18 feet 6 inches and 29 feet 6 inches, respectively. In the upper or twelfth story are four steel tanks, each of 40,000 gallons capacity, making a total sprinkler supply of 160,000 gallons of water. These tanks are accessible and can be repainted easily. The tank room is heated, thus doing away with danger from frost. This tower is a landmark for the southwestern district of Chicago, and is visible for miles. It has a sign, "McCormick," of white enameled inserts, seven feet high, on all four sides, which can be electrically lighted at night.



Typical Interior Showing Beam and Girder Construction in the New Reinforced Concrete Warehouse of the International Harvester Co.

Railway tracks under the building on the north and south provide trackage for 16 cars. The platform is covered with a fireproof steel and concrete canopy. All floors are provided with wall scuppers to let out water in case of fire.

The building permits the storage of 1,500 carloads of goods, the total floor area, including covered track and canopy-covered platform, but not including bridges, being 280,452 square feet. The total cubical contents, not including bridges, is 3,723,527 cubic feet. The cost per square foot is nearly 20% less than the square foot cost of a mill constructed warehouse adjoining the new building, which was erected several years ago under cheaper labor and material conditions.

The work was handled by the construction department of the International Harvester Company of New Jersey, under W. D. Price, superintendent of construction.

SELECTION OF SAND FOR CONCRETE.

Little Thought Is Too Generally Given the Comparative Value of Sand.

It may be said that specifications for sand used by the building trades have not changed for centuries, and it is sometimes believed that even in this enlightened age specifications in force are not as rigidly followed as in the earlier days when work was performed in a more primitive manner. Sand is such a common article of commerce and is usually so readily obtained that little thought has been given to the comparative value of sand, not alone as affecting the quality of the work, but also affecting the convenience and economy of construction from the contractors' standpoint. Some communities are more favored in having a better grade of sand than others, but in most any community there remains a wide selection, all of the sands, perhaps, costing about the same, if bought in the usual way, by the load or ton, delivered to the work, and yet a given sand may possess twice the strength of another sand from the same locality in the proportions of mortar or concrete commonly followed.

This may be further explained by stating that some sands in proportions of three parts of sand to one part cement will develop equal or greater strength than other sands in the proportions of two parts of sand to one part cement, or where the difference is not quite so marked, the better sand will develop a strength in three days equal or superior to the inferior sand at seven days, sometimes even for one month. The contractor is interested in having his concrete harden promptly, so that he can remove forms in as short a space of time as possible, and have them available for use again. If the concrete does not harden promptly so that the forms can be removed, and it is necessary to push the work, it means that additional lumber must be purchased, and thus directly affects the cost of the work. The cost of delays is always serious and never alike on different jobs, and the wise and prudent contractor, or even the small user of cement, will see that every precaution is taken to avoid delay and safeguard the results. It has been found that the real value of sand as a mortar ingredient, or for use in concrete, can be determined only by tests, and these may be anything from a simple practical test on the job to the more searching refinements of laboratory investigation. Unfortunately, the cost or inconvenience of having sand tested in the laboratory forbids this investigation in a great majority of cases, but it is perfectly possible for simple and practical tests to be made on the job. This may be performed somewhat in the following manner:

Take by measure about one quart of Portland cement, well shaken down, and three quarts of sand, of the variety under consideration, and mix the sand and cement thoroughly dry, and then temper with clean water to about the consistency commonly used in the work. Put this wet mixture in a form—if of wood, have same previously wet; if of metal, this, of course, is not necessary; tamp or shake down, and allow to stand in a protected place without being disturbed, and examine at the end of one day, two days, or three days. If the sand is of good quality, the mortar should be hard, and possessed of considerable strength at the end of one day; at the end of forty-eight hours remove from the form, and test by striking with a hammer for strength and hardness. If several sands are under consideration and tested in the same manner, it will be easy to distinguish between the best and the inferior sands. Having selected a first-class Portland cement and the best sand available, it must be borne in mind that concrete in sidewalks or

steps, where the area exposed to the sunlight and air is large compared with the bulk of the work, the concrete should not be allowed to dry too quickly, and should be protected from the direct rays of the sun, if possible. It would greatly improve work of this character if sprinkled frequently, after first hardening, for several days following the completion of the work.

Another test of sand that is perhaps more suggestive than conclusive is to fill a pint bottle about half full of sand, then entirely full of water, shake thoroughly, and then allow to settle. If much discoloration results, it is certainly an indication of dirt or loam, and this should always be avoided. After settling, the fine loam or non-siliceous material will be found on the top of the sand, and if in any quantity, this would suggest the need of further tests by combining with cement, as above described, before use. After having determined by the simple test, or the more elaborate laboratory tests if resorted to, the best grade of sand, it would be well to keep a sample of this sand to compare from time to time with the sand being delivered on the work, to see if the quality is maintained. It is well known that all sand pits furnish various grades of sand, and occasionally a poor lot may slip by without suspicion unless closely watched. The danger of using inferior sand is much lessened by the use of richer mixtures, and the difference in cost is nominal.

LARGE REINFORCED-CONCRETE PIER

Employment of 24-in. piles 75 ft. long, with a specially designed pile driver to place them; use of a special cement with a minimum of alumina to resist the chemical action of sea water and a timber sheathing at the water line to protect the concrete from frost action; the casting of the diagonal brace piles with a camber of from 2 to 5½ in. to allow for the bending moment of the pile's own weight—these are among the features of the new pier 2 under construction for the Inter-colonial Railway at Halifax, N. S.

The pier, which when completed will be 686 ft. long and 235 ft. wide, and will carry a shed 677x198½ ft., is the first of a series of four large piers proposed to replace four much smaller ones. The general plan shows the relative location of the old and new piers and their track connections. By this plan piers 2, 4 and 5 would be removed and pier 3 would be lengthened and widened to form the new pier 3. Work on pier 2 was started in the fall of 1911, and when the 1913 season had closed all but 120 ft. of the pier had been built and a start had been made on the shed. The shed will be a two-story structure, the lower floor being devoted to cargo and mail. The upper floor will be fitted up and used for a time for passengers and baggage, with the intention of subsequently changing it for freight use only.

Reinforced-concrete piles were selected as most suitable for the foundations. Borings showed solid rock at a depth varying from 52 to 68 ft., overlaid with from 2 to 12 ft. of hardpan and from 5 to 27 ft. of soft mud. This meant an average height of 75 ft. from rock to track level. The track level was fixed at 15 ft. 8 in. above extreme low water. Owing to the small height available above low water for diagonal transverse bracing, and the great depth from low water down to rock, it was thought that such a system of bracing would not greatly increase the stability of the pier and its ability to withstand shocks from vessels. It was, therefore, decided to use reinforced-concrete brace piles driven at an angle of 3 on 1. This is believed to be the first application of such a system of bracing to reinforce-concrete work. As a further means of stiffening the pier it was decided to make

a bank of dredged material under the pier so as to increase the amount of material through which the piles would be driven.

Two causes militate against permanency of concrete in salt water in this latitude. One of these is frost action, the water absorbed by the concrete at high tide freezing at low tide and causing the surface to spall away between the tide levels. The other is chemical action, which takes place between certain salts, notably magnesium sulphate, and constituents of the cement. Investigations have shown that this magnesium sulphate reacts with the free lime liberated during the setting of the Portland cement to form calcium sulphate, which in turn reacts with the calcium aluminate of the cement to form a sulpho-aluminate of lime. This last substance swells considerably on hydration, thus disintegrating the concrete, and it is evident that the extent of the disintegration varies directly with the alumina present in the cement.

To resist this chemical action arrangements were made with the cement manufacturers to supply cement with a maximum of 6.3 per cent of alumina, which was the lowest they could produce. It was also decided to use proportions of 1:1½:3, so graded as to produce as dense and non-porous a concrete as possible.

To withstand frost action it was decided to sheathe all concrete within the ordinary tidal range with timber. In order that this timber might be durable it is creosoted, and to prevent chemical action between the creosote and the cement the surfaces of the planks are coated with pitch.

Live loads of 1,000 and 500 lb. per square foot for the first and second floors respectively were assumed in working out the details of design. The spacing of the piles was determined by the spacing of the shed column, which in turn governed the load for each pile to carry. As the drawings show, the transverse spacing of the columns is 39 ft. 6 in.; the longitudinal spacing of bents is 18 ft. Three vertical piles and one brace pile carry each interior column and single intermediate piles carry the floor. This arrangement gives a distributed load of 80 or 90 tons per pile. To keep the load on the rock well within a maximum of 35 tons per square foot the size of piles was fixed at 24 in. square.

Eight round rods, from 1 to 1¼ in. in diameter, according to the length of the pile, and laced every 12 in. with ¼-in. rods, form the reinforcing. This lacing is spaced closer at the heads of the piles, and at the tapered points additional rods and spiral hooping are used. The points are 3 in. square and are not shod. To facilitate bonding with the decks the rods are allowed to project 3 ft. beyond the head of the pile, and in each pile there is also set a staple, made from a 1¼-in. square bar 7 ft. long, to aid in handling.

Similar reinforcement is used in the brace piles, but in order that when the pile is built into the pier and subjected to an axial compressive load of 80 tons the stresses due to this load and the bending moment of the pile's own weight may be uniform it is cast with a slight camber.

Little damage was done to the piles in driving. Only two out of 1,550 had their heads smashed, and these were among the first dozen driven, the cause being a continuation of the hammering after the pile had reached rock. No harm was done, however, by a few blows after the penetration had stopped. In order to find out what was happening to the point of the piles some of them were pulled out after having been driven to refusal. In only one case was there any damage done to the point, and this damage is believed to have been due to a sharp point of rock, which spalled off a small piece of concrete.

Usually about twelve piles were driven per ten-hour day, but when there were no delays as many as eighteen were placed.

In order to test the bearing power of the piles after driving a load of 120 tons was applied on the head of one of the piles and allowed to remain there for three hours. No settlement took place. The method of applying the load was as follows: The pile selected for the test was driven close to the cribwork bulkhead. Two 12x12-in. timbers were placed across the pile heads, bearing on a hardwood fulcrum. The inner ends of the timber were held down by a bracket firmly bolted to the base of the cribwork, and on their outer ends was placed the 16-ton steam hammer. The ratio between the outer and inner lever arms being 6½ to 1, the total load applied to the head of the pile was 120 tons. Other tests were made as the work proceeded, and in no case has any settlement of a pile been detected.

The entire work is being done by the Nova Scotia Construction Company, of Sydney, N. S., under the management of Hamilton Lindsay, vice-president of the company. John Kennedy, consulting engineer, of Montreal, is the designer and chief engineer, and is represented on the work by A. F. Dyer, resident engineer. The major part of the foregoing article was prepared from a paper presented some time ago by Mr. Dyer to the Nova Scotia Society of Engineers.

SELECTING AND OPERATING A GRAVEL PIT.

With the increased use of concrete has come a fuller realization of the necessity for well graded, clean aggregates. This has made it necessary for gravel producers to examine more carefully and to operate more efficiently their gravel pits.

Some valuable data on this subject are given by W. H. Wilms, president and manager, Universal Sand and Gravel Company, Covington, La., in *Engineering News* (New York) of November 5, 12, and 19. He points out the necessity, when opening a gravel pit, for sinking open wells rather than making borings, in order properly to determine the quality of material, for only by actual examination of all the materials excavated can a dependable analysis be made. Estimates on the cost of crushing over-sized material and of washing and grading all material then may be made with some degree of accuracy.

Where feasible, hydraulicking is a good method for stripping off the over-burden. This requires plenty of water, suitable disposition for the waste material, drainage facilities for waste water and ample grades for flumes or sluices to carry the material away. Where the loam is soft and there are no rocks, boulders or fine, dead, heavy sand, an 8 per cent flume grade and 1,500 gallons of water per cubic yard of material removed, operated at a pressure of 75 pounds per square inch, has proved ample.

In deciding upon the kind of machinery to use, the possible future increase in capacity should be considered. While a clam-shell, orange-peel, or drag-line bucket may be good for the first part of the work, it often leaves the pit in bad condition for the later use of a steam shovel.

In order to avoid costly delays, an efficient track layout is essential. Both ends of the track serving the plant should have connections with the outside railroad whenever possible and excessive grades and curves should be avoided, especially on the outgoing track. Track layouts permitting hauling by gravity will reduce greatly the otherwise large switching costs.

When it is considered that even 3½ per cent grades often are exceeded in hauling out of the pit, the necessity of using a locomotive of ample hauling capacity

becomes apparent. For regular work a locomotive should be used at not more than three-fourths of its maximum capacity, as this will prove advisable not only from an economical standpoint, but to provide for emergencies and a possible future increase of output.

Gravel washing and screening are comparatively simple processes, but even so require study and care in order that these operations may prove efficient. Modern washing methods consist of agitating the material with water until all impurities are in suspension or solution, drawing off the water continually and then rinsing the material as it leaves the screen. For these purposes conical revolving or Gilbert screens have proved satisfactory, as have several of the newer patented screens.

Those interested in sand and gravel washing equipment should write the Weller Manufacturing Company, Chicago; The Link Belt Company, Chicago.

NEW BOOK.

Reinforced Concrete Construction. Vol. II. By George A. Hool, S.B., Associate Professor of Structural Engineering, University of Wisconsin. Cloth, 6 1/4 x 9 in.; 666 pages; 409 illustrations. Price, \$5. Sent on receipt of price by Cement & Engineering News, 1117 Schiller Bldg., Chicago.

Volume I, which forms the first part of the course on reinforced concrete given by the Extension Division of the University of Wisconsin, was issued to meet the needs of correspondence students. It covers the fundamental principles which relate to rectangular beams, slabs, girders and columns. Volume II, which has just appeared, is considerably larger and includes 666 pages. Its essential aim is to present the details of practical design, and it covers, specifically, retaining walls (Part I) and buildings (Part II). It, like Volume I, is written for extension work, and on this account, the author states, it is somewhat more comprehensive than the ordinary text book. It evidences, however, the same maturity which characterized the first volume.

Part I (64 pages) covers earth pressure, the theory of stability and the design and construction of retaining walls. The Rankin theory of earth pressure is given, but the author prefers the more empirical method of finding an equivalent fluid pressure which, acting upon the ordinary gravity wall, will cause the resultant to intersect the base at the outer edge of the middle third.

Part II contains three sections—on design, construction and estimating respectively. The book closes with an appendix containing the last report of the Joint Committee on Reinforced Concrete as it appears in the "Proceedings" of the American Society of Civil Engineers, February, 1913.

The book is essentially descriptive and concerned with the multitudinous details entering into the various forms of concrete construction. In this respect it is one of the best on the subject. It is well illustrated.

Some mention must be made of the theoretical portions of the book. In Chapter 4 (on floors) the usual methods of slab and girder design are followed. A design of a floor bay with one-way hollow tile is given in detail. A valuable feature is the series of plates showing working drawings and steel-bending schedules (a recent development of the draftsman's art). Although the author devotes about seventeen pages to the theory of the flat slab, he throws no new light on the subject and advocates methods now known to be incorrect.

In Chapter 8 a square column footing is designed in detail.

Chapter 13 will be of value to the student already familiar with the theory of the continuous girder. Valuable tables and diagrams show the variations in moments and shears for different conditions of loading in beams of from two spans up.

In Chapter 14 an attempt is made to determine the bending moments in columns due to unsymmetrical loading on the floor girders. Formulae are given to find the slopes α of the axes of the beams where they meet the column, and assuming the columns to bend through the same angles the maximum moments in the latter are computed. These formulae are taken from the appendix of the book entitled "Reinforced Concrete," by Faber and Bowie. Inasmuch as the average engineer is not very familiar with secondary stress methods, and the above-named work has not had a very wide circulation in this country, it is unfortunate that the author has not reproduced the derivation of these formulae. His discussion, however, is of value in pointing out the existence of these secondary stresses and the absolute necessity of using low compressive units in column design.

Chapter 15 discusses the wind stresses in a high narrow building without diagonal bracing, considered as a vertical cantilever. The method is put forth only as an approximation, the assumption made not being at all in accordance with the facts. It must be regarded merely as one possible safe path by which the wind forces may reach the ground.

The book should be judged in the main by its practical aspect, and the great amount of new data and descriptive detail will make it an invaluable reference work for engineers and all others interested in reinforced-concrete construction. The typographical work is excellent and the cuts and reproductions are clear and inviting.

CONCRETE ROAD CONSTRUCTION

In a paper on concrete roads, read before the American Road Builders' Association, H. J. Kuelling, county highway commissioner of Milwaukee County, Wisconsin, discussed the foundation, width, thickness, ingredients and other features of such roads. Sufficient study has not, in his opinion, been made of the proportions to be given to the mixture. The aggregate to be used in each case should be studied and those proportions adopted which will give the greatest density obtainable; hydrated lime or some other inactive material being added if necessary to assist in obtaining this result. Almost, if not quite, as important is uniformity of mixing. This is determined to a considerable degree by the amount of mixing and also by the kind of mixing machinery employed. The latter point he thinks is commonly overlooked, but he believes that five turns with some mixers is as good as ten turns with others. The amount of mixing necessary also depends upon the shape of the individual pieces in the aggregate. In each case the number of turns of the mixer which should be required should be learned by carefully examining the output; attention being paid to the speed of the drum as well as number of revolutions.

Curing is very important, and the first step in this is to see that the subgrade is damp, sprinkling it in dry weather. The next step is to protect the road with canvas in case the temperature is over 90 degrees or the weather is dry and windy. As soon as it is sufficiently hard, the concrete should be sprinkled and covered with about 2 inches of earth taken from the side of the road and this should be kept wet (not moist) for about ten days.

The question of joints he believes to be the most unsettled one in connection with concrete roads. In Milwaukee County they have increased the joint spacings from 25 to 35 feet and finally to 50 feet, and at the present time see no reason for reducing the last distance. "I doubt very seriously the necessity for steel protecting plates, for no matter how carefully they are placed, there is a tendency to chip, thus demanding an almost immediate tarring of the joints. I believe the joints of the future will be merely felt or paper with a slight rounding of the joint with an edging tool, which will be filled in by the pounding down of the felt which has been permitted to stick up above the surface. I believe that the ability to get concrete that is homogeneous and impervious to water will have a marked effect upon the spacing of joints, as water content is more the cause of the movement in concrete than the changes in temperature."

For shoulders he prefers earth to gravel; and has found it unnecessary to bevel the edges of the concrete. Finally, he emphasizes the fact that a concrete road more than any other requires the most careful inspection by a man of judgment who appreciates to the utmost the importance of detailed work.

CEMENT TILE ROOFING ON THE BUILDINGS OF THE PITTSBURGH PLATE GLASS COMPANY, CRYSTAL CITY, MISSOURI

The buildings shown in the illustration on this page are covered entirely with cement tile roofing, and are part of 17½ acres of similar buildings, all under this type of roofing.

The approximate total weight of all of the roofing is 6,302 tons. The extensive use of cement roofing on these buildings of the Pittsburgh Plate Glass Company at Crystal City, Missouri, illustrates the popularity which this roofing is meeting with, and the progress being made in the manufacture of cement roofing material.

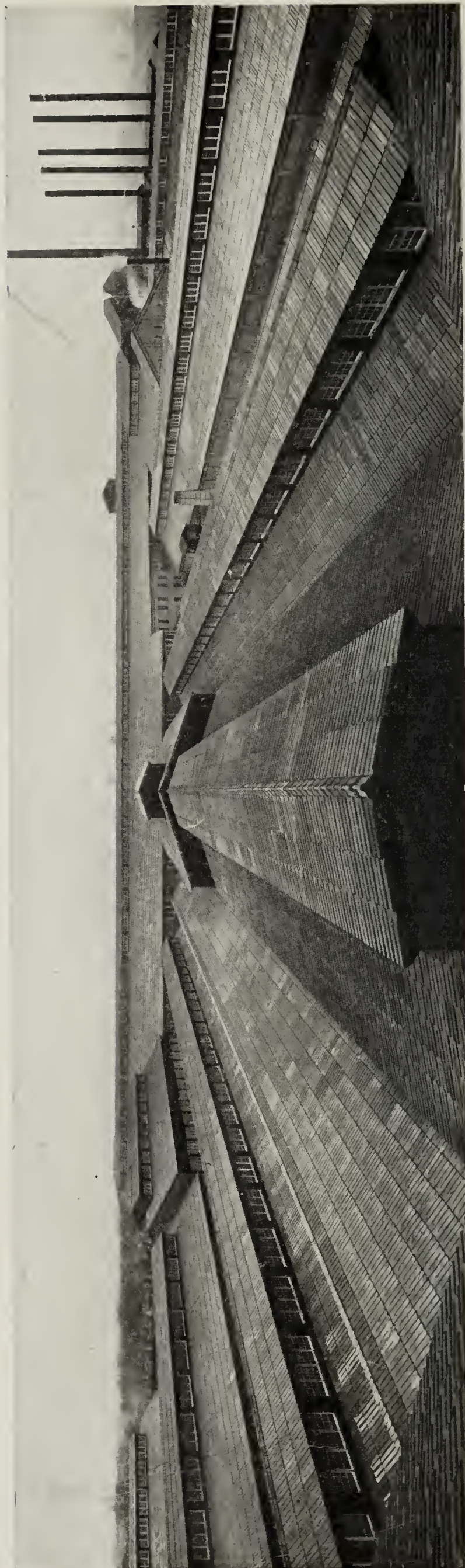
The tile illustrated are made by the American Cement Tile Manufacturing Company, of Pittsburgh, Pa. They are 7/8 of an inch thick, and are made from clean, sharp river or lake sand, which is mixed in proper proportions with Universal Portland cement, and some other ingredients, to which is added a sufficient quantity of water to make good concrete.

The tiles are made on suitable forms to give the required shape. Each tile is reinforced near its under side by a sheet of expanded steel to take the tension stresses. After being formed, the tiles are water-proofed, and allowed to set for at least thirty days.

When placed on a roof, the tiles are interlocked, and simply laid on the steel work without in any way being fastened or cemented to same. Sufficient clearance is provided so that any expansion is taken care of, the tiles adjusting themselves to changing conditions. They present no point of attack to heavy winds.

The advantages of this type of roofing are the economy and strength of the tiles, their resistance to the wind and to destructive gases, and their entire resistance to fire. The tiles are absolutely waterproof, and are subject only to willful damage.

The cost compares very favorably with good slate roofing on sheathing and owing to the superior qualities and absence of repairs, the cost is, in the long run, considerably less.



Cement Tile Roofing on the Buildings of the Pittsburgh Plate Glass Company.

HOW TO ERECT SMALL CONCRETE BUILDINGS

The present insistent demand for the substitution of durable, sanitary and fire-resisting materials for those not possessed of these properties has been a pronounced factor in hastening the adoption of concrete. The change means impervious and monolithic structures as opposed to those consisting of the more familiar types of masonry with their attending wooden features of combustible nature, the latter also affording refuge for much that is noxious and unsanitary. This enduring method of construction is now applied



Fig. 1. A Concrete Poultry House. This Building Rests on Concrete Piers and Has a Concrete Floor, Partition and Walls. The Walls Are Only Four Inches Thick.

to all parts of buildings in order that there may be a practical elimination of maintenance cost.

Small buildings for one purpose or another are always required upon the farm. These structures include poultry houses, hog pens, smoke houses, wagon houses, garages and buildings designed for storage purposes. If they are built of masonry or frame, the

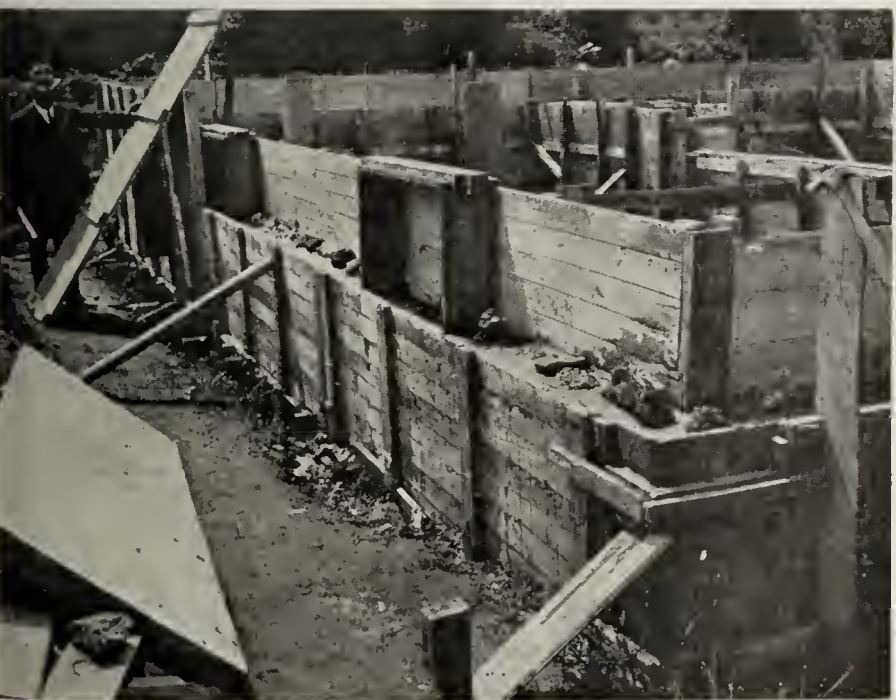


Fig. 2. Sectional Form for Concrete Wall Construction.

services of experienced workmen are usually required unless the structures are of the rudest type. The purpose here is to describe briefly a method of constructing, without the aid of mechanics, small con-

crete buildings for some of the uses specified. Dimensions may be increased or reduced as occasion requires. Where enlarged upon and supplied with proper conveniences, a building of this character would answer admirably for a small residence. If the natural color of the concrete is objectionable, it may be coated with a wash in any color desired, thus making these small structures a picturesque as well as useful appurtenance to the main buildings of the farm.

The Foundation

Let it be assumed that the building is to be 8 feet wide by 12 feet long, with a height to the eaves of 7 feet, inside dimensions. A building of this size might be suitable for several of the purposes mentioned above. The foundation should be 12 inches wide and 3 feet deep, which will carry it below frost line. Mark on the ground a rectangle $7\frac{1}{2}$ feet wide by $11\frac{1}{2}$ feet long. Outside of this rectangle mark a larger rectangle $9\frac{1}{2}$ feet wide by $13\frac{1}{2}$ feet long. This will leave a space of one foot between the lines all round. Dig between these lines to a depth of 3 feet. This forms the foundation trench. The concrete for the foundation should be mixed in the proportion of 1 part Portland cement, $2\frac{1}{2}$ parts sand and 5 parts stone

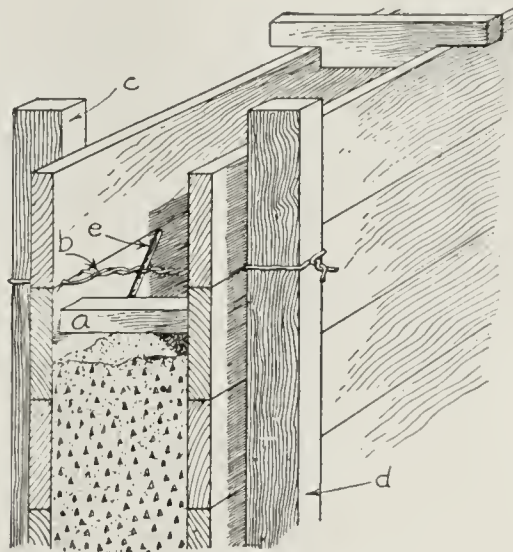


Fig. 3. Method of Tying Forms with Wire to Prevent Them from Spreading.

or gravel. Fill in the foundation trench with concrete to ground level, being careful to prevent earth from the trench walls from falling into the concrete. The top of the foundation should be brought to the surface of the ground and made perfectly level. To insure this, test it with a carpenter's spirit level.

The Walls, Windows and Doors

The walls of a building of this size will need to be only 6 inches thick and they should be erected on the center of the foundation, leaving 3 inches of foundation on both sides. The forms can be made complete, and, if more convenient, can be assembled flat on the ground and then raised into position. The wall forms should be made of 2x4-inch studding placed upright and spaced about 2 feet apart. Upon this studding should be nailed, horizontally, 1-inch boards. These boards will be next to the concrete and must be fitted together so as to insure a tight joint, and if it is desired to give a very smooth surface to the finished wall the joints should be carefully matched. The forms, to prevent them from spreading, are tied by means of twisted wire passing between the 1-inch boards and around the upright studding, as shown in Fig. 3. To provide for the window openings, a rough frame made of 1-inch boards, 6 inches

wide, should be set in the forms at the proper location. Sometimes, after the forms have been filled with concrete to the height of the windows, the window frame itself is placed in the form and the concrete cast around it. The openings for doorways should be made in the same manner. As soon as the forms for the walls—both the inside and outside forms—are in place and made plumb, the concrete can be deposited between them. The top surface of the concrete previously placed in the foundation should be rough but thoroughly clean and very wet, in order that a good bond between the concrete in the foundation and the concrete in the wall will result. To prevent the development of cracks in the walls, it is a very good practice to reinforce them with fence wire or light rods, running in both directions. This is not absolutely necessary, however, for a very small structure, but in any case it would be well to place in the corners, where the walls join, light rods bent in the shape of an "L." These rods should be 2 or 3 feet long and placed about every 12 inches of height. The frame for the doorway should be placed in position before the concreting is started. It is sometimes the custom to tack lightly to the door frame a strip of wood tapered so that its larger side is in the concrete. When the rough door frame is removed this strip remains in the side of the door and can be used for fastening the door hinges. Some prefer to dispense with this strip of wood. They drill directly into the concrete wall in providing for hinges.

Mixing and Placing the Concrete

The concrete for the walls should be mixed mushy wet and in the proportion of 1 part Portland cement, 2 parts sand and 4 parts stone or gravel. In placing the concrete, spade it thoroughly with a thin board paddle, thrusting the latter between the forms and the concrete in order that the stone or gravel may be forced away from the forms, which will leave a smoother surface than would otherwise result. This not only allows the rich mortar to flow against the forms, but prevents the formation of air pockets and projecting stones at the surface of the wall. It will be found convenient to place the concrete until it reaches the height of the window sill. The window frames are then placed and the concreting continued until the height is about 2 inches above the top of the windows. Then, in order to strengthen the concrete over the window openings, lay two $\frac{1}{2}$ -inch steel rods over each window. These rods should be long enough to extend about a foot on each side of the window space. In a similar manner rods should be laid over door openings, these rods to prevent any cracking of the concrete over the openings. The balance of the concrete is then deposited until the height of the eaves is reached.

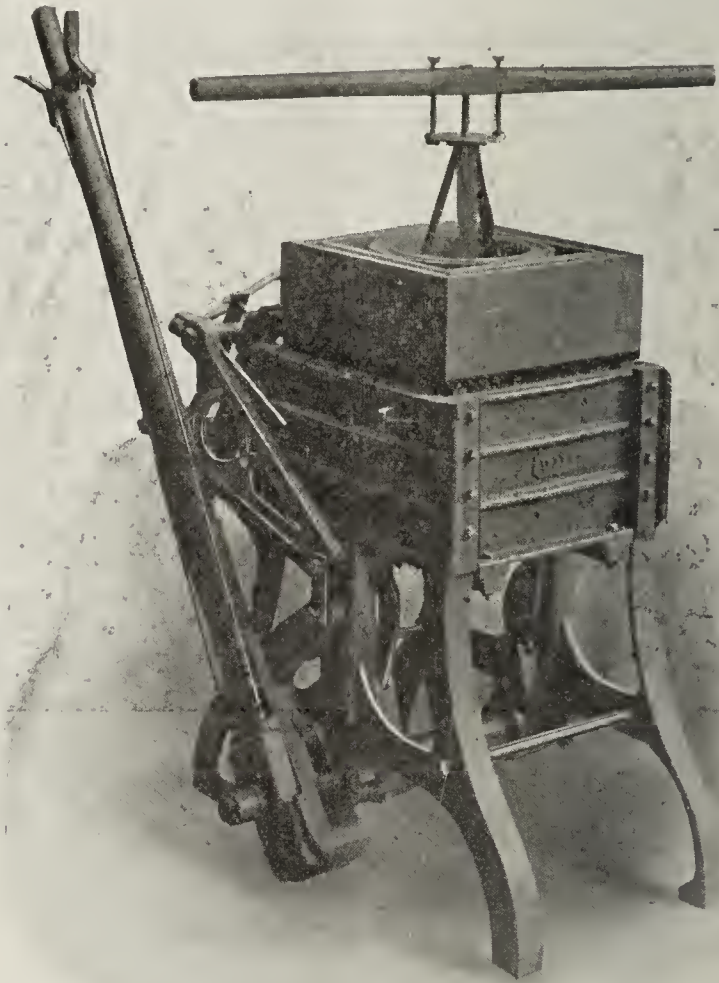
Roof Construction

On the top surface of the wall there should be embedded vertically in the fresh concrete $\frac{1}{2}$ -inch bolts with the heads down. These bolts extend about 12 inches into the concrete and about 6 inches above. They can afterwards be used in fastening down the wooden sill to which the rafters are attached, if the roof is to be constructed of wood. Either a flat or a peaked roof can be used. If a flat roof, it is sometimes the practice to arrange for rectangular pockets in the top of the walls, into which the roof beams can be set. When a flat roof is to be constructed, make one side of the building lower to provide sufficient pitch for drainage. The forms for the walls should be left in

place about one week and no weight should be placed on the walls for three weeks or one month.

If a concrete floor is desired, proceed as in the case of sidewalk construction; that is to say, put down a layer of cinders or gravel and place over this the concrete pavement. Make this of a 1 : $2\frac{1}{2}$: mixture of Portland cement, sand and stone. To prevent the concrete pavement from cracking, divide it into sections or slabs, say 3 or 4 feet square, being sure that the joints extend entirely through the concrete.

If a wooden floor is preferred, the beams or stringers may rest upon the 3-inch projection of the foundation walls.



Multiplex Chimney Block Machine.

AIR-INSULATED CONCRETE CHIMNEYS

The Multiplex System of ventilated chimney flue construction, for which molding machines are made and sold by the Multiplex Concrete Machinery Co., of Elmore, Ohio, has unique features that specially commend it to the practical chimney builder and the up-to-date ventilating engineer.

In the first place, the flue opening is round, which insures greatest efficiency of draft because of total absence of dead air space. This obviates the tendency to clog with soot or creosote.

Almost entirely surrounding the round flue is an air space, leading into which are openings in the outer block wall wherein registers may be placed for ventilating rooms from basement to uppermost story, without interfering with the smoke draft in the slightest. The air in this ventilating space is warmed by the heat of the flue, thus increasing the draft for ventilating purposes. The insulation of the interior flue makes the chimney fireproof; and this machine is claimed to be the only one on the market which combines these two features of fireproof insulation of flue and ventilating chamber to carry off foul air and odors from basement and rooms. Write the Multiplex Company for their circular and mention Cement and Engineering News.

Among The Cement Mills

AIR POWER FROM THE MISSISSIPPI IN ATLAS PORTLAND CEMENT PLANT

One of the first private industrial plants to be operated by power from the Keokuk dam on the Mississippi River is that of the Atlas Portland Cement Company, at Hannibal, Missouri.

In August, 1913, the steam-driven air compressors of the Atlas Co. were replaced by three cross-compound air compressors, with 26 and 15¼ by 18-inch cylinders, each machine having a capacity of 2,000 cubic feet of free air per minute. These compressors are directly connected to 400-h. p. synchronous electric motors running at 187.5 r.p.m., using three-phase, 25-cycle, 220-volt current. This current is stepped down at the transformer station from a voltage of 33,000, at which tension it is transmitted from the Keokuk plant, on the Mississippi River, about sixty miles distant.

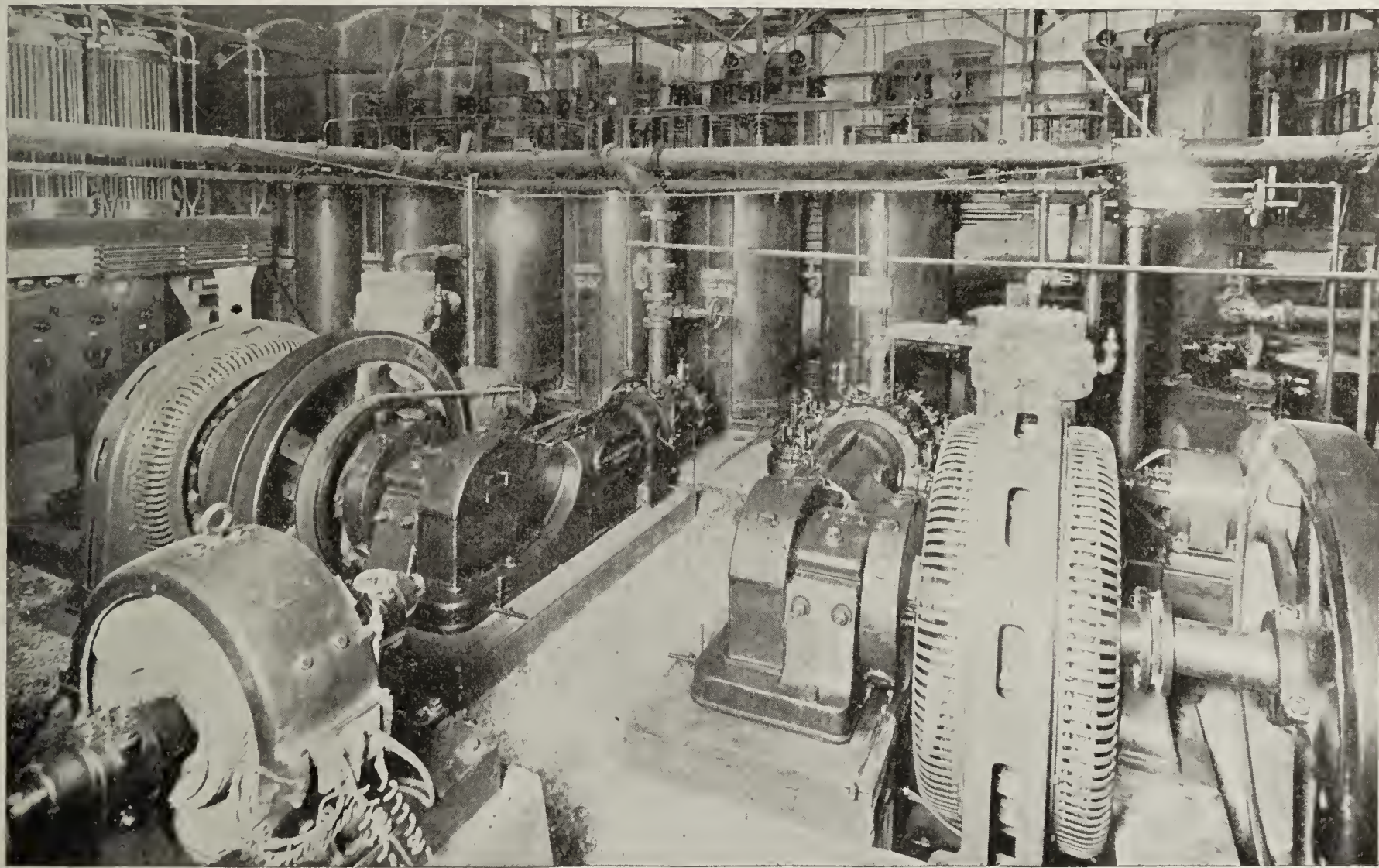
large compressor plant of its kind operated by power from the Keokuk plant.

The illustration shows the motors direct connected to the crankshafts of the compressors. The large step-down transformers for the compressors and for other purposes in the works are shown at the rear and side of the room.

We are indebted to William H. Baker, superintendent of the Atlas Co., for the foregoing data.

THE DANGER OF DUST IN CEMENT MILLS

This feature of the manufacture of cement is receiving more attention every year. The cement industry of the United States is learning this lesson by following the customs of the foreign cement maker. A modern, up-to-date cement plant should have a good dust-collecting system in same, to stop as much as



Air Compressors in Plant of Atlas Portland Cement Works at Hannibal, Missouri, Driven by Electrical Energy from the Missouri River.

An average receiver pressure of 100 pounds is maintained by means of total-closure unloading valves on each machine. These unloading valves are operated automatically, so that five per cent regulation is obtained in receiver pressure.

To supply the present demand of the plant, the energy input to the compressors will average about 12,000 kilowatt-hours per day. The principal use for this air is found in a blast supplying pulverized coal to rotary kilns and for drills in the limestone quarry. Air is also supplied to the machines in the blacksmith shop for operating hammers, hoists, drills, etc., and there are outlets at convenient points throughout the plant for cleaning motors and other apparatus.

This installation was made by the Stone & Webster Engineering Corporation, of Boston, and is the first

possible the man-killing dust that is floating around in the air. Our German cousins have dust collecting units throughout their plant, and would not think of operating without them, as they prove not only beneficial to the employes and save wear and tear on machinery, but they prove a valuable source of revenue.

We lately visited a cement mill that was very dusty, that had natural vents on the ball mill to the outside. The dust that had escaped and lodged on the roof caused an immense waste and it also required men to shovel the dust off of said roof to keep it from breaking down. There were tons of this dust, which was from the raw end, shoveled off the roof every month, all of which cost money and all of which could be avoided if a good dust-collecting system was applied to the Ball mill grinders. This is one instance that we mention.

Among The Cement Mills

There are quite a number of cement mills throughout the United States in the same condition. We claim that 80 per cent to 90 per cent of the dust that is floating around in every department of the cement mill can be eliminated. This should make the conditions very much better. The fine dust that is collected with the dust-collecting system is generally the most valuable part of the cement product.

True, there are quite a number of complications arising, such as catching the dust from kilns, owing to the extreme heat, but even this can be taken care of.

The dust generally found in the grinding and screening departments of a cement mill, both on the raw and finished end, can be eliminated.

There is also a great deal of waste from driers. To solve this problem it requires a special dust system. An efficient and practical dust-collecting system should be designed by experts that devote their time to this business, as it is in a line by itself. The designing of the air trunks and connections, the proper size fan and speed for same, to do certain class of work, and finally, the proper size and style of collector or dust arrestor, all should be worked on scientific lines. There are several concerns that make this a specialty. They should be employed to do this work. Local superintendents in cement mills often try to do this them-



Atlas Portland Cement Works, Hannibal, Mo.

selves, and make mistakes, which very seldom prove satisfactory, and they therefore feel that a dust-collecting system in a cement plant is not practical. This is wrong. A dust system can be made just as practical in cement plants as it can in a flour mill, which is proven by the excellent results obtained by our foreign brothers in the same industry.

Mr. W. G. Clark, president of the Clark Automatic Dust Collecting Company, Fisher building, Chicago, Ill., is making a specialty of putting in dust systems in cement mills, and he has designed a self-cleaning wind trunk and also slip joint tributary pipes, so that the heat caused in grinding, in pulling off the dust and condensing the pipes, to a certain extent, will not interfere with the general working of the dust system. This is a step forward.

He has also invented a new metal dust collector for collecting cement dust, thus doing away with cloth straining devices, which are short lived and require constant attention.

The writer feels that all cement mills should be equipped with a dust-collecting system, divided into units, according to the size of the plant, and also a rule formed in every cement plant for more care and attention devoted to this question of dust elimination.

A learned doctor once stated that dust was man's most deadly enemy. That one-half of the deaths are caused by dust. Therefore, in dusty industries, such as cement making, a great deal of care and attention should be devoted to this question of dust elimination, and we look to see the future cement plant of America practically free of dust.

RIVERSIDE CEMENT COMPANY SETS OFF 60 TONS OF EXPLOSIVE

The Riverside Portland Cement Company this week set off the biggest charge of nitroglycerin ever exploded at one time in southern California, utilizing approximately 120,000 pounds, or 60 tons, of the explosive. The charge was exploded by electricity at 12:20 o'clock Monday, and the rising volume of cement, rock, smoke and dust was recorded on moving picture films. For six months crews have been working into the mountain of limestone at the company's plant at Crestmore, near Riverside, and for two weeks four men have been placing the nitroglycerin in the holes drilled at intervals along the 500 feet of tunnel. It is estimated that between 125,000 and 135,000 cubic yards of material were dislodged and rendered available for the crushers at the mill, which will probably have sufficient limestone available to keep it supplied for a year. The mountain side to a height of 160 feet and for a distance of 900 feet was shattered by the explosion, which was successful from every standpoint.

BONNER CEMENT PLANT

The plant of the Bonner Brand Portland Cement Company reopened last week at Bonner Springs after

several months' idleness and gave employment to 175 men.

Henry McGrew, general manager of the company, said about \$50,000 worth of improvements have been made, including a storehouse which will enable the company to work through the dull season to prepare for the ensuing rush. Mr. McGrew says the company has plenty of orders for the coming season.

TRAFFIC MANAGER FOR CEMENT COMPANIES

Fred C. Dumbeck, formerly assistant general freight agent of the Frisco in Chicago, who was transferred to St. Louis three years ago, where he has since served the same road in a similar capacity, has removed to Chicago. Mr. Dumbeck is now traffic manager for three cement companies—the Marquette Cement Manufacturing Company, the Chicago Portland Cement Company and the German-American Portland Cement Works.

PENINSULAR CEMENT WORKS

The dry grinder at the cement mill of the Peninsular Portland Cement Works, Cement City, Mich., was started last week and the rest of the mill will be in operation in a few days. Although they are installing new rotaries, these will not be ready for use for some time and the burning will be done in the old rotaries. One new kiln is in place and an extra gang of men is here putting up the smoke stack, which will be 120 feet high. The second of the large rotaries is on the grounds.

Among The Cement Mills

ATLAS CEMENT COMPANY

A revival of water transportation on the Mississippi river, between New Orleans and St. Louis and points in the middle West, is promised in a fortnight. The statement was issued Tuesday that the revival is but the beginning of great activity on the river that will mean the establishing of a new and important export grain route to the city next season.

The Atlas Transportation Company, an allied concern of the Atlas Portland Cement Company, has the enterprise ready to be launched, and one of the officials of the company has been in New Orleans two days discussing the situation with grain dealers and getting information on probable grain movements for the future.

The Atlas Transportation Company operates a fleet of sixteen barges to the city, carrying the freight for the Atlas Portland Cement Company from the company's plant at Hannibal to New Orleans. Two tow boats are used, the Josh Cook, running from Helena, Ark., to New Orleans, and the Barrett, one of the largest craft of its kind on the river, running from Hannibal to Helena.

It is now planned by the company to add to its

"FIRE, RATS, HOGS AND ROADS"

The frightfulness of fire, the abhorrence of rats, the health of hogs and the advantages of good roads are the striking subjects portrayed vividly in the four new posters with the above headings just ready for issue by the Universal Portland Cement Co.

With millions of dollars worth of property lost annually through construction incapable of withstanding fire, with myriads of rats carrying disease and destruction wherever possible, with great numbers of valuable live stock sacrificed to unsanitary conditions,—as in the recent epidemic of "Foot and Mouth" disease among the cattle herds of Michigan, Illinois, Indiana, etc.,—and with a country-wide need for the efficient improvement of street and highway systems, these are timely and very worthy suggestions for the thoughtful consideration, not only of all who have been losers by previous conditions but the practically unlimited number of citizens who would be benefited by the more universal adoption of concrete for all the purposes for which it is suited.

Appreciating the fact that while many have had the results of such conditions impressed upon them, far too few have been advised of the effective remedy, the



equipment and carry all sorts of freight from St. Louis and Central Freight Association points to New Orleans, carrying freight from New Orleans to St. Louis and points on the return trip.—New Orleans Journal.

EGYPTIAN PORTLAND CEMENT CO.

The new Egyptian cement plant at Fenton, Mich., has resumed operations. For several years the plant has been closed, and its reopening means better times ahead for residents of Fenton and vicinity. For several months, ever since the purchase of the plant by Harry J. Paxton of Detroit, a gang of workmen has been employed making repairs, and Saturday the last of these were completed. The boats on the lake are in good condition and some new ones have been added. The repairs have cost in the neighborhood of \$150,000. It is expected that about 100 men will be employed and many of these will reside in Fenton. Mr. Paxton came to Fenton on Tuesday and is inspecting the running of the plant.

TO STAMP DATE ON CEMENT SACKS

A bill before the state legislature of Michigan designed "to protect users of cement by requiring that sacks or bags containing it shall be stamped with the date when put up, by proper storage and to provide a penalty for violation of the same," has drawn the fire of the Michigan Manufacturers' Association. A bulletin by J. G. Hoffman, secretary, calls the attention of cement manufacturers to the proposed legislation, branding it "unnecessary" and based on inaccurate information.

Universal Co. has taken pains to have these posters designed to compel attention and to create constructive ideas.

Thus in the "Fire" poster is indicated the destructive effect of the flames upon the old non-resistive types of building construction, while standing out and above the heads of the crowd and impervious to the attack, is a great office building of reinforced concrete.

The skull and cross-bones is the grim symbol at the feet of the green-eyed rodent in the "Rat" poster, but a suggestion is carried by the white background which may be taken to represent a vermin-proof wall of concrete.

Although of all live stock raised on the farm for consumption in quantities probably the hog is the most careless in regard to the conditions in which it gets its food, the cleanliness of the concrete feeding floor, indicated in the foreground of the "Hog" poster is obviously a sufficient safeguard in even such cases.

Facilities for travel and transportation between farm and town and even between cities constitute one of the chief needs of the present day, when it is appreciated that not only is isolation unnecessary but a large portion of the expense of marketing is chargeable to inefficient hauling. Concrete has been proved suitable for city pavements, carrying either heavy freight or the faster pleasure traffic and its adaptability for highway construction, as illustrated in the "Good Roads" poster, is now being demonstrated in every quarter of the country.

In bringing out the essential characteristics most strikingly, artist Frederick H. Crouse of Cleveland, by whom the posters were designed, has played only upon

the vital points and endeavored to keep simplicity the key-note. The freedom of life peculiar to the handling has been carefully retained in the reproduction. Harmonious but distinctive combinations of four different colors on each of the posters have been secured in the lithographing. All together there are a total of six colors used: purple, brown, green, orange, grey, black and the white of the stock which is used to make certain parts of the hand-drawn lettering stand out distinctly.

The posters are each 19"x28" and are sent out carefully enclosed in mailing tubes, upon request to the Publicity Bureau of the Universal Portland Cement Co., Chicago, by whom they have been prepared.

CONCRETE ROAD BOOKLET

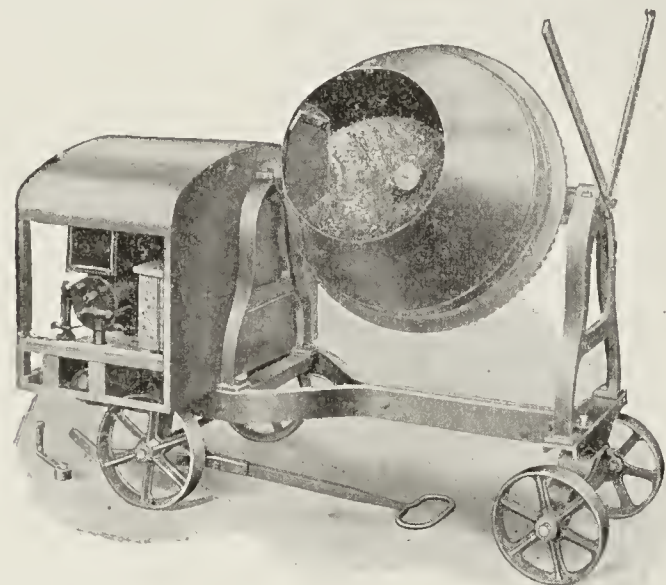
An unusually interesting and valuable booklet relative to concrete roads, prepared by Arthur C. Newberry, will be sent gratis on application to the Sandusky Portland Cement Co., Sandusky, Ohio. It contains particulars as to initial cost of concrete roads, durability and resistance to wear, cost of maintenance, details of construction, and also recommendations of The National Conference on Concrete Road Building and specifications of the Association of American Portland Cement Manufacturers for concrete road ways.

THE BIG-AN-LITTLE-CONCRETE MIXER

The Big-an-Little concrete mixer shown herewith is of the drum or tub type, and three of the distinct features of this type of machine are:

First—The large opening in the drum permits the operator to see the exact condition of the mixture and he can make the entire batch just as wet or dry as he desires.

Second—The entire batch or any part of it can be dumped instantly.



Third—It is the easiest machine on the market to keep clean. You can see the drum has no square corners and the mixing paddles stand off about $\frac{3}{4}$ of an inch; all that is necessary is to put in a bucket of water and let the machine turn a few revolutions; turn the drum upside down and it is as clean as the day it left the factory.

The Jaeger Machine Company are making these machines in three sizes—10-foot, 5-foot and 3-foot capacity. They are also making a street and road paver mixer. This machine is self-tractor and is meeting with phenomenal success.

The company is always ready to prove any claims they make by putting their machine right on the job, and if it does not do the work properly, you have the privilege of returning it. We cannot see how any broader proposition could be made, and we believe it would be to the advantage of anyone who mixes concrete to write the Jaeger Machine Company, 212

West Rich street, Columbus, Ohio, and get their catalog.

"INFUSO" STEEL PARTS

Heavy sledge hammer blows or a milled file make no impression on our "Infused" steel parts, writes the Steel Improvement Company, Cleveland, Ohio. Some of the things the "Infuso" process does: Increases three times the life of gears, pinions, couplings, spindles, shafts, forgings and heavy duty parts of all kinds. "Infused" mill gears give months of service where ordinary gears last only a few weeks. Increases tensile strength by 50 to 100%. Produces the strongest, toughest and most durable steel. Eliminates all waste in material due to improper treatment.



Heavy Sledge Hammer Blows or a Milled File Make No Impression on "Infused" Steel Parts.

The "Infuso" process is not case hardening. It is a scientific and practical method of heat treating which in every case renders any steel stronger, tougher and more wear-resisting. It builds up the core of the metal as well as the surface and makes a strong, tough core. It is the result of eight years' experiencing in laboratory and in actual practice. Let us serve you as we are serving many others. Our corps of experts in the science of commercial heat treating are at your service. The "Infuso" process is too important for you not to investigate fully. Write the Steel Improvement Co., Cleveland.

STEEL FORMS

Contractors may be interested to learn that the Heltzel Steel Form & Iron Works, Niles Road, Warren, Ohio, have proceeded with the construction of a new and modern addition to their present plant which will more than double the capacity.

The building will be erected on a site of three acres in the heart of the steel district, and with shipping facilities served by the Erie and B. & O. railroads, giving a direct outlet to the most important eastern and western points.

The general office will remain at Warren, and the Cleveland office will be discontinued after 1915. Offices will be opened in New York, Pittsburgh and Chicago. Stock of standard form equipment will be carried in New York.

This company has recently developed and has secured patents on designs of steel forms for various types of construction which is claimed will revolutionize the steel form industry. Heretofore the Heltzel Company confined their business mostly to the lighter forms of construction, such as steel forms for sidewalks, curbs, curb and gutters, roads and forms for every type of road construction, and have engaged to a limited extent in the manufacture of sewer, wall and culvert forms.

The plans are to manufacture on a very large scale their new design of sewer, bridge, wall and building forms.

It is proposed to eliminate the riveted form entirely, and that one of the most modern electric welding plants will be installed.



The Link-Belt Portable Wagon Loader.

LINK-BELT WAGON AND TRUCK LOADERS

Catalog No. 210 of the Link-Belt Company of Chicago describes and illustrates wagon and truck loaders for handling coal, coke, stone, sand and similar loose materials from storage. The past few years have demonstrated the success of Link-Belt portable wagon and truck loaders for loading loose materials from ground storage, and portable machines have proved their superiority over hand-shovelers from every standpoint of efficiency and economy.

Link-Belt loaders have become so popular that today they are in successful daily use from coast to coast. These machines not only handle anthracite and bituminous coal, of which each year there is a greater amount carried on ground storage, but they are winning constantly increasing recognition for loading sand, stone, gravel and similar loose materials, as well as coke at gas plants, clinkers at cement mills, and foundry refuse at manufacturing plants.

Wherever quantities of loose materials must be loaded into wagons or trucks, with ease and dispatch, and at a low cost per ton, the Link-Belt portable wagon loader should prove to be a profitable investment.

GASOLINE-DRIVEN STONE UNLOADER

The accompanying illustration shows a novel gasoline portable stone unloading machine, developed at Galion, Ohio. There is no item of expense, in construction work, too small to deserve attention; and the handling of stone is by no means one of the smallest problems with which the road builder has to contend.

One of the most useful and economical of machines designed for the modern highway builder, it is claimed, is this portable gasoline-driven stone unloader. The old and still most common way to unload a car of crushed stone, is to employ men with shovels in the car. Four is about the largest number that can load one wagon at a time, and the work proceeds very slowly as each man digs a place for himself down to the bottom of the car.

The disadvantages of this system were much increased



when it became the custom of railroads to build nearly all cars with pockets in the bottom. The handicap of cars with pockets and bottom doors is converted into an advantage, however, if the car can be unloaded by some suitable unloading device. A trestle for this purpose is not always at hand, is an expensive arrangement to build, and, when the work at that point is completed, is a dead loss, as it cannot readily be moved.

By using the unloader here shown all that is necessary is to dig a small pit beside the track, with one side sloping up under the track between two of the ties to accommodate a steel chute. This chute catches the stone as it drops from the pockets in the bottom of the car, and allows it to flow by natural gravity to the hoisting bucket in the pit. The chute is equipped with a gate to control the run of stone from the car to the bucket. The building of the pit is inexpensive, and is not objected to by railroad authorities.

It will be seen that in operation the hoisting bucket is lowered into the pit, the chute gate lifted, and the stone allowed to run into the bucket until it is filled. The gate is then closed, the bucket hoisted, and the material automatically dumped into the top of the bin or hopper, ready to be loaded into wagons through chutes provided for this purpose.

Only one man is required to operate this machine, and it will handle practically any material that will go through the bottom of the regular hopper cars furnished by railroads. In fact, it can be used with any kind of drop-bottom car, but self-cleaning cars are the best.

It is claimed that these machines will easily handle forty tons of crushed stone per hour. The storage bin or hopper has a capacity of 18 tons, and the bucket holds $\frac{3}{4}$ of a cubic yard. The power for the hoist is furnished by a hopper-cooled 8-H.P. gasoline engine having plenty of power to handle any load the bucket will hold, as fast as the machine can be operated.

Cement and Engineering News, 1117 Schiller Bldg., Chicago, will gladly furnish you a catalog illustrating and describing this stone unloader.

"PERFECTION" CONCRETE STAVE SILO

Every wide-awake farmer in this country—and those to whom the term does not apply are few and far between—is today convinced that he needs a silo. A lot of them have been able to have silos built, but more of them have not been able. This past year, crops were better than ever before; and the amount of money available for improving the farms is larger than at any previous time. The farmers all are going to have silos just the moment they can—it is simply a question of selecting the best.

The Perfection Concrete Stave Silo Co., Suite 506, Clapp Bldg., Des Moines, Iowa, have a system of concrete stave construction which offers many advantages both to the builder and to the man who will own the silo. But little capital is needed to start in the manufacture and erection of "Perfection" Stave Silos, and the profits are the kind that soon swell the bank balance.

Their proposition is practically new, and the early

the superior quality of sand and gravel dredged from the bottoms of the Monongahela, Allegheny and Ohio rivers having created a demand for it far afield. Originally, all of these commodities used in Pittsburgh were taken from the harbor bed and conveyed on scows to the yards of the several concerns and thence, as disposed of, by vehicular conveyance to the point of consumption. In time, however, the harbor bed was denuded of its deposits and the dredgers were constrained to seek others more or less remote from their storage yards, necessitating either the towing of scowloads to the city or the loading of their contents on cars and their transportation hither by rail, whereupon freight tariffs came into play and, coincidentally, complaints by the sand people of discrimination in rates. Every railroad entering Pittsburgh has among its patrons one or more of these sand-dredging concerns, and all of them have joined in an effort to establish a scale of carrying charges that shall prove fairly remunerative to themselves and equitable to the shippers, but with ill success until now, the dredgers having been unable to agree among themselves. It is announced, however, that they are in accord for the



Pit and Plant of Mason City Sand Company, Mason City, Iowa, Showing Locomotive Crane so Mounted That it Is Used for Stripping, Loading Cars at Pit and Transferring Gravel from Cars to Screening Plant.

birds are sure to catch the fattest, juiciest worms. Full particulars will be sent anyone inquiring; and exclusive territory will be given the right men.

FREIGHT RATES ON SAND

Retrieving sand and gravel from the three river beds in this vicinity has come to be an industry of parts within the past few years and continues to grow in volume and importance with the constantly increasing use of concrete. A score or more of concerns, employing a large amount of capital in the aggregate and hundreds of persons, are now engaged in it and the product of their labors, although consumed here for the most part, finds its way also into outside markets,

first time and that, accordingly, a meeting of representatives of the railroads and dredgers will be held shortly, at which it is expected the matters in dispute will be adjusted. Meantime the railroads are awaiting the next move of the dredgers.—Pittsburgh Dispatch.

SAND RATES

The Illinois public utilities commission, under authority granted by the supreme court, will pass on the alleged discrimination in rail rates. The court permits the commission to file a petition for a writ of mandamus to compel the Chicago & Northwestern railway to obey the mandate of the circuit court of Sangamon county ordering the railroad to desist from

its discrimination in rates against the Atwood-Davis Sand company at Roscoe, admit the company to the so-called Fox river zone, and charge it the same rates charged other companies in the zone. The railroad appealed the case, contending the commission did not have the power to pass on alleged rate discriminations.

—Peoria Star.

THE BOSS 3,700-POUND PAVER

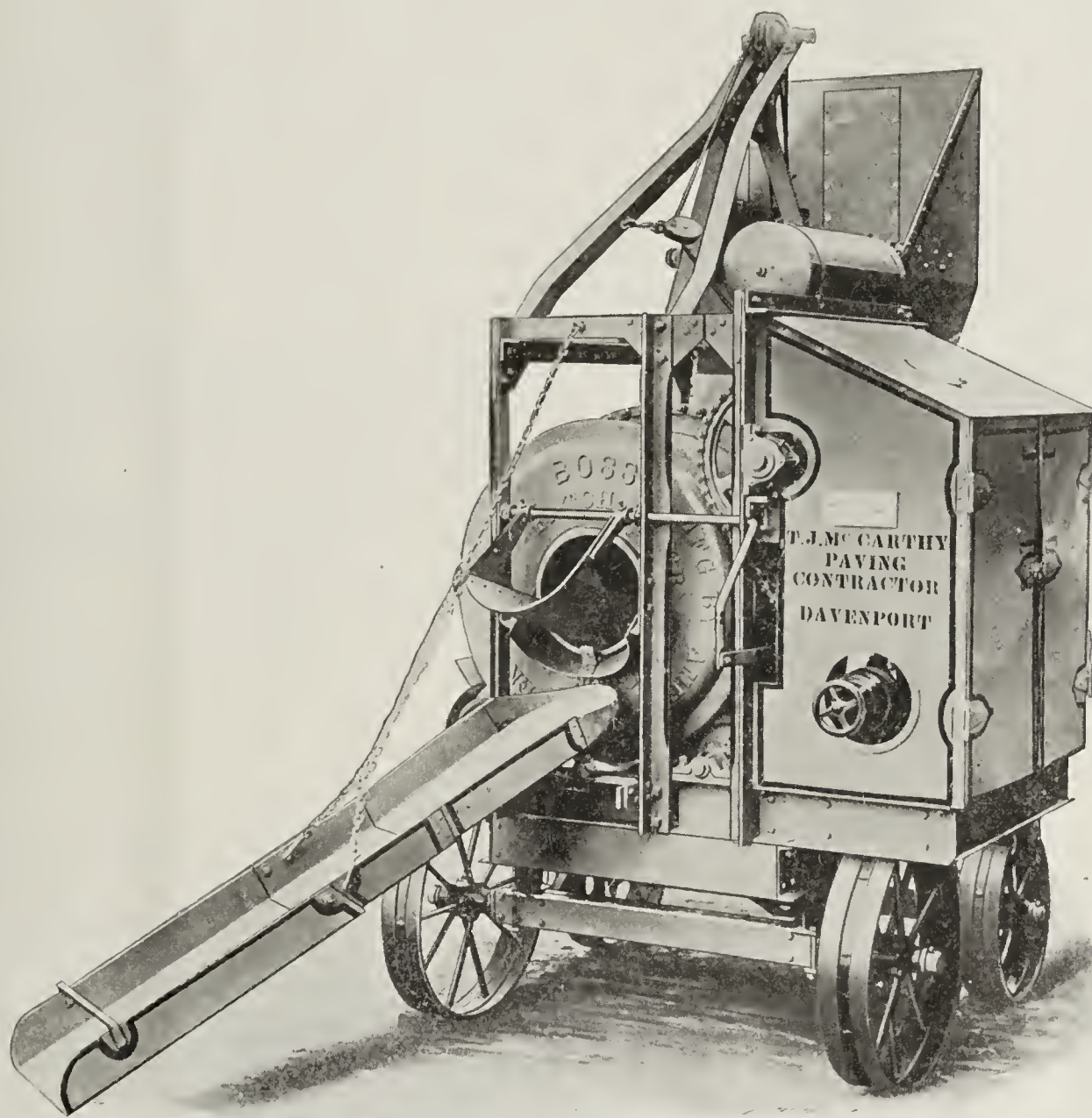
On this page is illustrated an up-to-date light paving mixer, which is sold at a startlingly low price. The machine is built of steel, resulting in a saving of over 2,000 pounds useless weight; a team moves the machine to any place. It has a short wheel base, with 28-inch rear, 22-inch front wheels, 5-inch tires, running in wagon track. Can be moved by hand or furnished with traction and steering wheel; equipped with HYATT ROLLER BEARINGS, automatic power loader, new chain-tightening device, batch counter; in fact, every modern improvement.

before the state utilities commission. The basis of the complaint was that the railroads entering Toledo and Sandusky have discontinued an allowance of 8 cents a ton for loading sand. The Toledo and Sandusky concerns contended that the action of the railroads will mean a loss of \$24,000 to them this summer on contracts already made. The Toledo complainants are the Doville Sand & Gravel Company, Toledo Builders' Supply Company, Citizens' Sand & Gravel Company, Hoist Builders' Supply Company, and Acme Coal & Builders' Supply Company.

CEMENT CHUTES AND TOWER EQUIPMENT

The H. B. Sackett Screen and Chute Co., 1679 Elston Ave., Chicago, Ill., has just issued a booklet illustrating and describing their concrete chute and concrete tower equipment, concrete hoist bucket, hopper, etc., which they will gladly send to any of our readers. The Sackett Company writes as follows:

"Sackett-Chicago' Concrete Chutes are of the open



The "Boss" Mixer for Paving Contractors. Front View Showing Sectional Chute. Note Rigid Construction, High Wheels, Wide Tires.

Its capacity is one bag cement—at 5-3-1 mixer. Capable of putting down 800 square yards paving, or 125 cubic yards, a day.

Because of its compactness it is an ideal machine for all types general concrete work, paving alleys, county roads, car tracks, sidewalk and curb, and gutter work.

THE AMERICAN CEMENT MACHINE CO., Inc., 9635 Johnson street, Keokuk, Iowa, the manufacturers, also build an 11-foot "Light" steam paver and the famous Little BOSS line of mixers.

SAND AND GRAVEL RATES

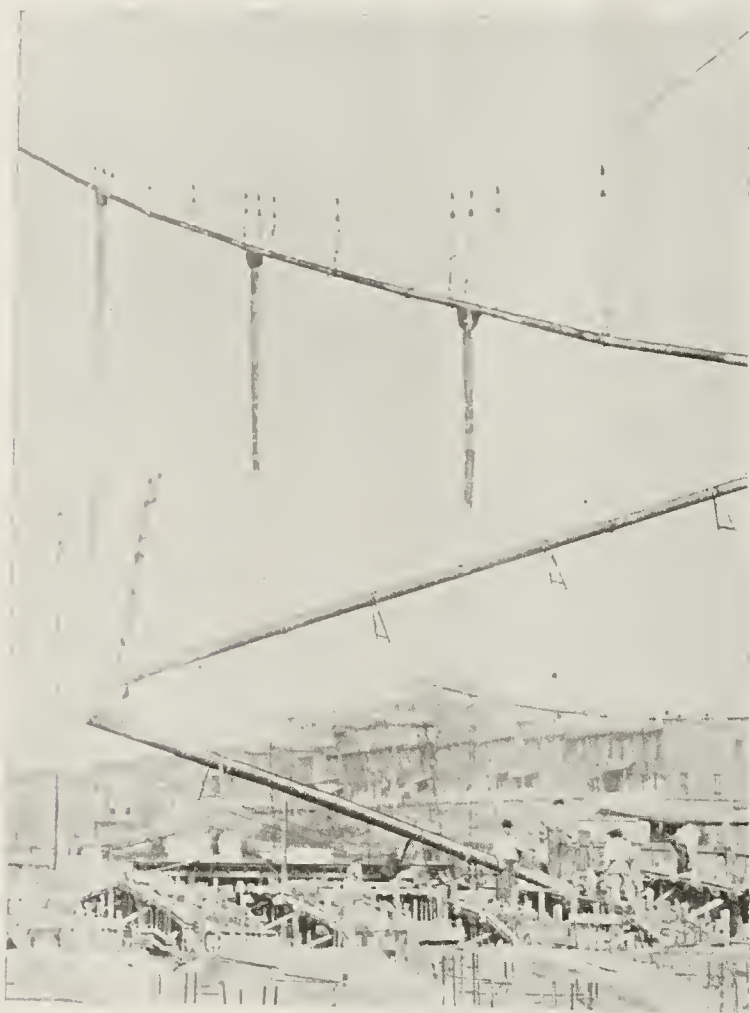
All Toledo sand companies were made complainants

type, with reinforcing angles running the entire length along the top edges, and with heavy cross-braces every three feet. All sections have bails for use with supporting cables, and are also provided with the necessary tie clips and punched angles for receiving truss rods and frame, should it be desired to convert several sections into one Trussed Chute at any time.

"For Continuous Line Chutes, one Remixing Hopper Section and one Discharge Section with Splash Hood may be used with any number of the Intermediate Sections to get the desired length. These sections are strongly bolted together and have a six-inch overlap which gives great strength with flexibility.

"The Remixing Hopper of a No. 525 Section has a bail, which can be attached either to the Concrete Hoist Tower Distributing Hopper or to the drop hook at the end of No. 527 Discharge Section, which forms a swivel connection as shown in illustration.

"A single Chute having Remixing Hopper and Bail at one end, with Splash Hood and hook at discharge end is used at the end of Continuous Line Spouting



Tower and Chutes for Distributing Concrete. Chutes Are Manufactured by the H. B. Sackett Screen and Chute Co., Chicago.

for distributing, and is usually supported by cable or 'A' frames.

"Trussed Chutes are formed by connecting a Hopper Section with Discharge Section, or if a greater length is needed, bolt one or two Intermediate Sections between these.

"If no Intermediate Sections are used, only one Truss Frame will be needed, together with four Truss Rods with Turnbuckles. Should Intermediate Sec-

tions be used, two Truss Frames, Intermediate Truss Rods and Stay Rods will be required in addition to the Truss Rods with Turnbuckle.

"As every Chute Section we build has the Tie Clips and Punched Angles provided for receiving this additional equipment, any of our Chutes are quickly converted to Trussed Chutes when desired."

U. S. STANDARD CONCRETE MACHINERY.

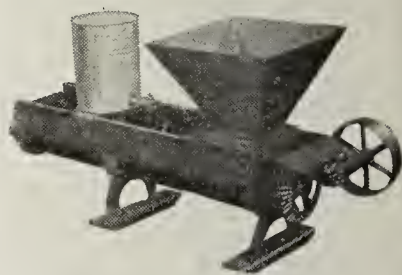
Two immensely interesting catalogues to the prospective concrete machinery buyers are those of the U. S. Standard Manufacturing Company, 325 Virginia avenue, Ashland, Ohio, illustrating and describing U. S. Standard Mixers and U. S. Standard Block machinery.

The U. S. Standard mixer, equipped with a dependable measuring and proportioning device, are manufactured in four different sizes—The Junior Stationary of five yards capacity, especially designed for block, brick and tile plants; the Junior Portable of five yards capacity, especially meeting the requirements of the contractor and builder; the Senior A of seven and one-half yards capacity, and the Senior B of ten yards capacity. Every required capacity is covered by the range of these four mixers.

The catalogue devoted to U. S. Standard block machinery illustrates and describes the U. S. Standard block machine, the numerous face plates, the product and other valuable information on the subject of block machines and block manufacturing.

Copies of the catalogues will be sent on application to the company at Ashland, Ohio.

ONLY \$26.00 FOR X-L All Continuous BATCH MIXER



We make the largest line of small Batch and Continuous Mixers on the market. Whether you are a Cement Block, Brick, Tile Manufacturer or a Contractor, or whether you have a mixer, you should send for our literature as we make a specialty of manufacturing concrete mixers for different lines of work.

The chances are that it might pay you to discard your old mixer after you see the X-L All Special and we know it will pay you to investigate if you have use for a concrete mixer.

Burrell Manufacturing & Supply House
KANKAKEE, ILL.

WANTED & FOR SALE DEPARTMENT

FOR SALE.

We can save you 25 to 50 dollars on a concrete mixer. High grade machines, fully guaranteed. Get our price before you buy. Superior Mfg. Co., 1405 Concrete Ave., Waterloo, Iowa.

Cement Chemist of wide experience and with best references will accept position with company offering opportunity for advancement. Address B. F., care Cement & Eng. News, Chicago.

Chief chemist, at present employed, desires change of location. Can furnish best references from past and present employers. College graduate. 12 years' successful experience. Address W., care Cement & Eng. News, Transportation Bldg., Chicago.

WANTED

Position by experienced cement tester. Eight years practical experience. For particulars and references address H. R., care Cement & Engineering News. State salary paid.

FOR SALE.

Troeman balance, nearly new. Used one week in private laboratory. In perfect condition. Address E. D., care Cement & Eng. News, Transportation Bldg., Chicago.

WANTED

One No. 7½ Gyratory Crusher. Give full particulars and price in first letter. Address Box 20, care Cement & Engineering News, Chicago, Ill.



SAVE \$100—WHY NOT?

"The Quality Mixer at the Right Price"



The Bottom Knocked
Out of High Mixer Prices

Buy the
Republic "Six"
at
Your Own Price

When quality and price meet you get an investment worth while

See Catalog showing

**LOW CHARGING HOPPER
BATCH HOPPER
POWER LOADER
HOISTING ATTACHMENT
SPOUTING ATTACHMENT**

**\$100
TO
\$295**

The strongest and best built mixer of this class on the market. Put it in use anywhere. Haul it over the roughest roads. Put it up against any mixer regardless of price for quickness and thoroughness of mix and if you don't find it a bigger, better mixer in every sense of the word, send it back and we will refund your money.

Guaranteed REPUBLIC "SIX" Insured

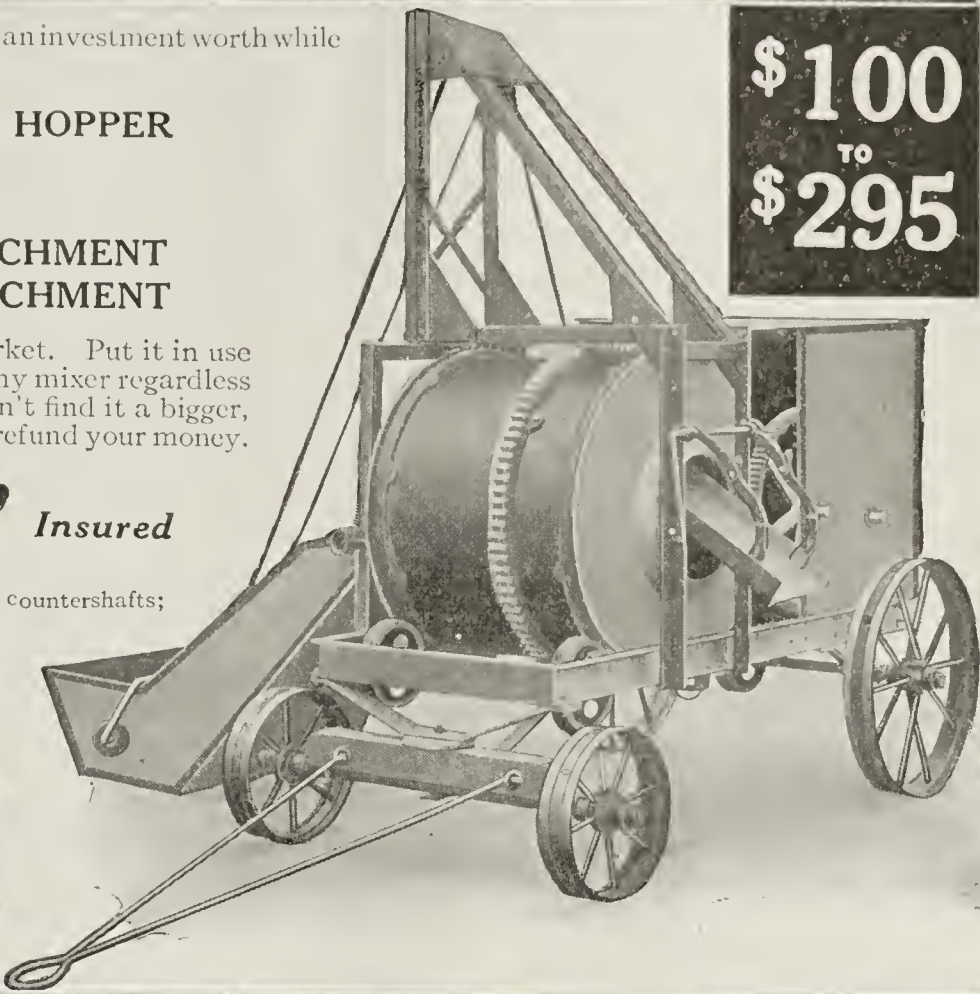
Notice this high grade construction—5-inch steel channel frame; steel countershafts; steel gears; frost and dust proof engine; 30-inch x 4-inch rear wheels; gearless power loader; light weight; low charging hopper; a 30-second mixing drum—everything like the \$2,000 pavers.

You can't go wrong on this mixer. Write today, *before you forget* and let us tell you in how many ways the REPUBLIC "SIX" will make and save money for you.

THE REPUBLIC IRON WORKS

LANSING, MICH.

PITTSBURGH, PA.



Our Molds and Construction Patented

USE PEERLESS SILO AND PEERLESS WALL MOLDS

Peerless Silo Molds are the largest daily capacity molds on the market, building 7½ ft. daily, including chute, with same labor and cost as others build 4 to 6 ft. This means 3 to 5 days labor expense and time saved on every silo. It means one extra silo every month, the profits from which will PAY for a Peerless Mold in one season. THINK THIS OVER, and write for Peerless particulars.

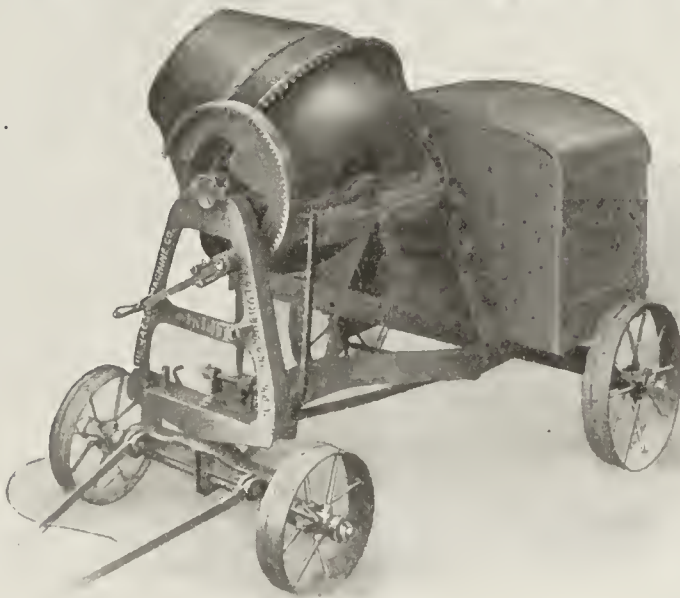
Use Peerless Wall Molds and stop wasting lumber. Barns as well as silos should be of concrete. HERE IS TO THE ALL CONCRETE FARM BUILDINGS. Ask us about them.

New Enterprise Concrete Machinery Company
68 W. Monroe Street Chicago, Ill.

STOP! LOOK! LISTEN!

Just the Mixer You've Been Wishing for

THE BIG-AN-LITTLE



Just a little bit better than the one you thought was best

1915 Model NOW READY

The small mixer has proved its worth. Contractors see that it pays better to have one or more small portable mixers, than to mix by hand or to have a great big clumsy mixer. The question has been to get a DEPENDABLE Small Mixer at a low price.

The Big-an-Little is the biggest and best small mixer on earth, and our low prices amaze the mixer world.

Your neighbor has one. They are used everywhere. Ask him.

Write us

The Jaeger Machine Co.

212 W. Rich Street

Columbus, Ohio

SLAG from blast furnaces for Concrete

Blast-furnace slag used as an aggregate in concrete represents economy, safety and strength

For many reasons, blast-furnace slag is an ideal concrete material—its alkaline nature, tending to prevent rust in reinforced concrete—its light weight, enabling it, in floor slabs for instance, to support a given live load with smaller dead load on supporting frame—its contents of silica, alumina and iron, which increases the permanency of any concrete of which it is a part—its fire-resisting qualities—these are some of the features which have impelled the most careful engineers and architects to specify slag in place of other concrete aggregates.

The high crushing strength of slag-concrete has been demonstrated in various tests made of unprejudiced parties in nearly every large city. Slag-concrete has always developed strength uniformly higher than gravel-concrete or limestone-concrete.

Engineers and Architects

Blast-furnace slag as a concrete material is better understood than it used to be. Before you write your concrete specifications, get in touch with any of the following competing producers of blast-furnace slag—let them submit the results of long-time tests of slag-concrete.

Birmingham Slag Co.

1001 Woodward Building
Birmingham, Ala.

The Sommerfield Co., Inc.

1863 61st Street
Brooklyn, N. Y.

The France Co.

Second National Bank Bldg.
Toledo, Ohio



The Commonwealth Power Co. tunnel under Grand Ave., Milwaukee, Wis., recently successfully waterproofed with

"Hydrite"

COLORLESS WATERPROOFING

Hourly Leakage 5200 Gallons STOPPED! 700 ft. Concrete Tunnel 55 feet below datum was made watertight.

The success of our method eliminated the necessity of pumps and SAVED \$80.00 to \$100.00 PER MONTH.

In addition to the possibility of damage to the cables, etc., from the seepage. This tunnel, 10 years old, has been free from leakage for nine months, or since work was completed. We guarantee it to stay so.

HAVE YOU A WATERPROOFING PROBLEM?

Difficult waterproofing problems in NEW or OLD work can be economically and successfully solved. The experience of a successful organization is at your service and satisfactory results are guaranteed.

Our method of applying grout, internally or externally, under heavy pressure through pipes, or upon the surface, as the conditions require, is applicable to tunnels, reservoirs, foundations, basements, etc., of masonry or concrete construction. Leaks are not only stopped but the structures are strengthened.

Let us help you with your waterproofing problem. Write us concerning our product and methods. Ask for descriptive booklet.

WATERPROOFING COMPANY OF AMERICA MILWAUKEE, WIS.

Branch Offices:
543 McCormick Building, Chicago. Callahan Bank Building, Dayton, Ohio.
1014 Transportation Building, Montreal, Canada.



SIDEWALK FORMS CURB AND GUTTER FORMS

The contractor who bids on sidewalks, curbs, curb and gutters with the idea of using wooden forms is generally bidding under a definite handicap and will always do the work with less profit than he could with steel forms.

HELTZEL steel forms represent the very latest designs and their use means better work and better profits. Spread over the work of a season or two they mean a lower form cost per running foot of sidewalk than the use of wood forms. They are easily assembled. Work is fine, accurate and even. Write today for Free Catalog.

Heltzel Steel Form & Iron Works
Niles Road, Warren, Ohio



THE LOW DOWN FORCE FEED MIXER

has a capacity of from 4 to 12 cu. yards an hour with a forced feed and stroke off measurement different from all others. It gives absolutely perfect proportions whether the materials are wet or dry. Cannot clog. You can set and lock the feed gates so there will be no variation.

Few parts, open-to-view mechanism and low down hoppers make this mixer economical in operation and upkeep. Feed can be changed without stopping the machine. Safety friction clutch enables you to stop or start the machine without stopping the engine. Construction perfect. Price remarkably low.

Find out more of the Low Down's good features. Send for Catalog "B," which gives detailed information. Mention Cement & Engineering News when writing.

ELITE MFG. CO., Ashland, Ohio

The HARDING MORTAR MIXER Successfully Mixes Hard Wall Plaster and Brick Mortar

The sensation of the Chicago and Omaha Cement Shows was the rapid, successful and thorough mixing of hard wall plaster with hair and fibre, lime mortar and Portland cement with the Harding Mortar Mixer. We mixed the actual material for the "show me" type of contractor, and made good with him.

With this Mixer you save the wages of one to six laborers on every job. One laborer can do the work of four; two men can do the work of eight.

You save one-quarter of your material bill. Thorough mixing permits use of more sand.

You get perfect mortar, impossible to get mixing by hand. Machine mixed mortar is uniform. It spreads easier, hangs together better and sets harder.

You make a good mortar man out of any laborer.

You have Mortar all the time, and exact amount to last you until quitting time. The machine is fast. A batch can be dropped out in ten times the time the material could be mixed in the box. Write us for proof from Contractors and details now. Sold on Free Trial.

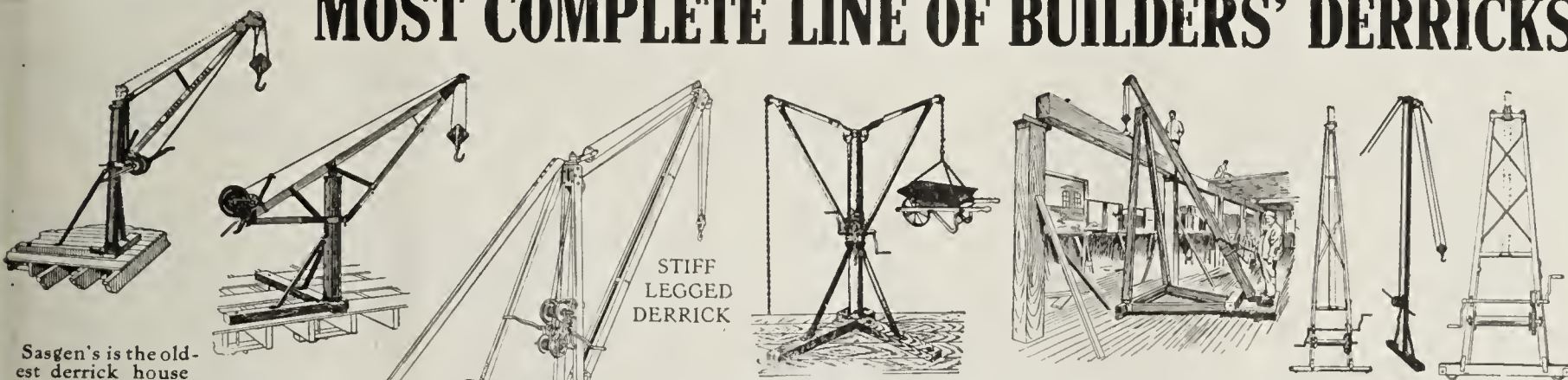
Architects are beginning to specify machine mixed mortar. An exceptional proposition for representatives in unoccupied territory.

The Mortar Mixer Corporation

700 Washington St.,

Iowa City, Iowa

MOST COMPLETE LINE OF BUILDERS' DERRICKS



Sasgen's is the oldest derrick house in the country. We make the strongest, best and most reasonable price derricks.

We manufacture Steel and Wood Circle Swing Builders' Derricks, hand and power. Pole, Setter, "A" Frame, Double Boom Wheelbarrows, Stiff Legged and Guy Line Derricks, Single and Double Drum Geared Winches, Blocks, etc.

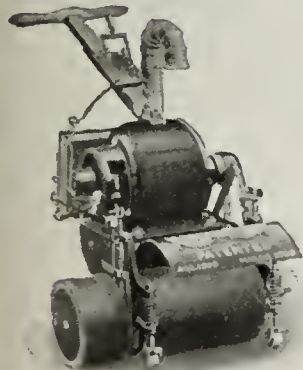
SASGEN DERRICK COMPANY,

2052 North Racine Avenue, CHICAGO

WRITE FOR CATALOG No. 15

TEST AND TRY BEFORE YOU BUY

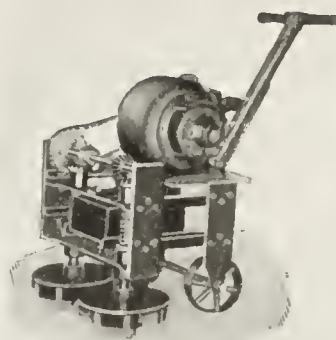
The Schlueter Rapid Floor Surfacer



The Schlueter BALL BEARING electric floor surfacing machines for mosaic, marble, composition and wood floors are the most simple constructed machines on the market. Direct chain drive AUTOMATIC DUST COLLECTORS. No gears or clutches to wear. Made in various styles.

OVER 5,000 IN USE ALL OVER THE WORLD

Send for prices and free trial proposition



THE M. L. SCHLUETER CO.

225 W. Illinois Street, CHICAGO

GET THE LANSING HABIT

Contractors Are Finding It Not Only a Difficult One to Overcome, But a Profitable One to Form.

We Are Headquarters
For Everything in
The Concrete Line



These 1915 Model Lansing Mixers

are making great records for low concrete costs and troubleless operation.

HERE IS OFFERED

Sturdy Construction—LONG LIFE—LOW OPERATING COST—STEEL CUT GEARS; machined track and trunion rollers; heavy steel channel frame; high, wide wheels; low charging hoppers; powerful engines; friction clutch like an automobile; batch hoppers or side loaders.

Tell Us What You Need and We Will Tell You What It Costs. Ask for Catalog No. 354

LANSING COMPANY

LANSING, MICHIGAN, U. S. A.

or address our nearest warehouse. We carry stocks at the following:

Southern Factory—Parkin, Arkansas.
Boston—78 Cambridge St. Charlestown District.
Chicago—169 West Lake Street.
Kansas City—1413-1415 West Tenth Street.
Philadelphia—Willow and No. American Streets.
New York—285-289 West Street.
Minneapolis—330-334 First Street, North.
San Francisco—333-348 Brannan Street.



Long Handled
Cement Finishing
Tools
Operated
Automatically

One Man With The Double Action Cement Tools Can Do the Work of Five

in a given time with old style finishing tools—
which means a SAVING of EIGHTY PER CENT
OF THE FINISHING COST OF YOUR WORK.

All Our Finishing Tools Work Automatically

Finishing Trowel has 24-inch blade; 16-inch
trowel with jointer attachment, edger and float.

BETTER WORK AT LESS COST

Send For Catalog and Prices

ABRAM CEMENT TOOL MFG. CO.
DUGGER, IND.

The Perfection Concrete Stave Silo

made by the "wet mix" system.

The staves are so formed that any diameter of silo can be built. The staves are made by the "wet mix" system by casting them in our steel moulds. The product is a strong, non-porous, water proof stave, made with common labor and right at the "silo job." No factory required; you save railroad freight, loading and breakage of staves.

Our "All-Steel Door-System"

is ideal and just what the silo feeder demands. Doors continuous from bottom to top of silo; size 24x25 inches in the clear.

Concrete Workers

get into the Concrete Stave Silo business. It is a growing and permanent business, and our system makes you big Profits.

Get the best form of construction—one that can not be out classed later.

Get the "Perfection."

Write us to-day for our liberal proposition to supply you with our steel moulds and exclusive territory. Let us give you facts and figures on ease of erection, permanency of construction and low cost and big

Profits

to you. You will be highly interested. Write to-day.

Perfection Concrete Stave Silo Co.

506 Clapp Building

DES MOINES, IOWA

"Little Giant" (Model A) For Small Jobs

Price, \$75.00 f. o. b. Belding

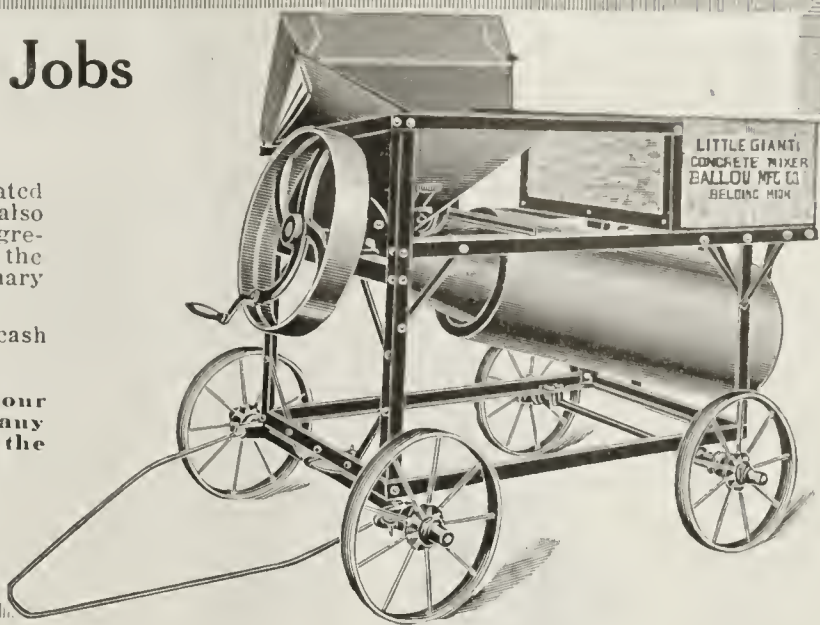
This Hand-Power Concrete Mixer has a proportioning device which can be regulated so closely that it will vary less than one-half of one percent. Special means are also provided for thoroughly blending the ingredients, and for properly wetting the aggregate. Its blend will bear the very closest inspection. We don't claim a man can do the work of an engine, but reports from users show that 5 yards per hour is quite ordinary with a "Man at the Crank" of our "Little Giant" Model A.

We also build Power Mixers with steady running Air-Cooled Engines. For spot cash we will pay the freight on machine shown. Complete satisfaction guaranteed.

Do not take our statement for it, but let us send the mixer and leave it to your judgment while on the job. We will send a mixer on five days' trial to any responsible party, or upon guarantee of payment or deposit of price while the mixer is being tried out. Send for Catalog.

BALLOU MFG. CO.,

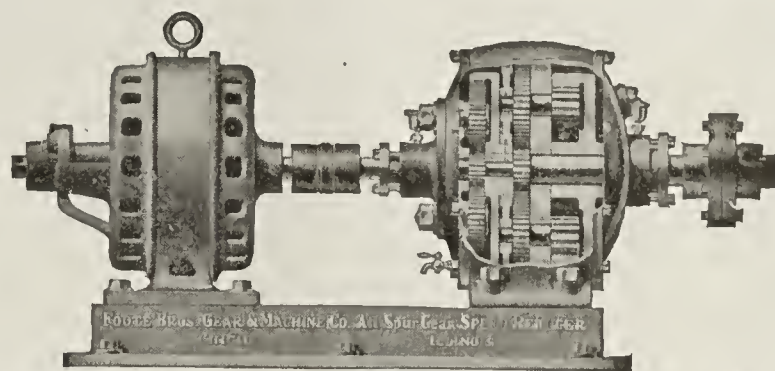
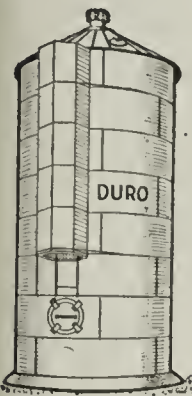
99 HIGH STREET
BELDING, MICH.



"DURO" METAL Tops—Doors—Frames and Forms for Erecting Concrete Silos and Tanks PURE IRON GALVANIZED

will last as long as the silo.
Write for prices. Manufactured
only by

**C. C. Fouts Co., 220 Canal St.
Middletown, Ohio**



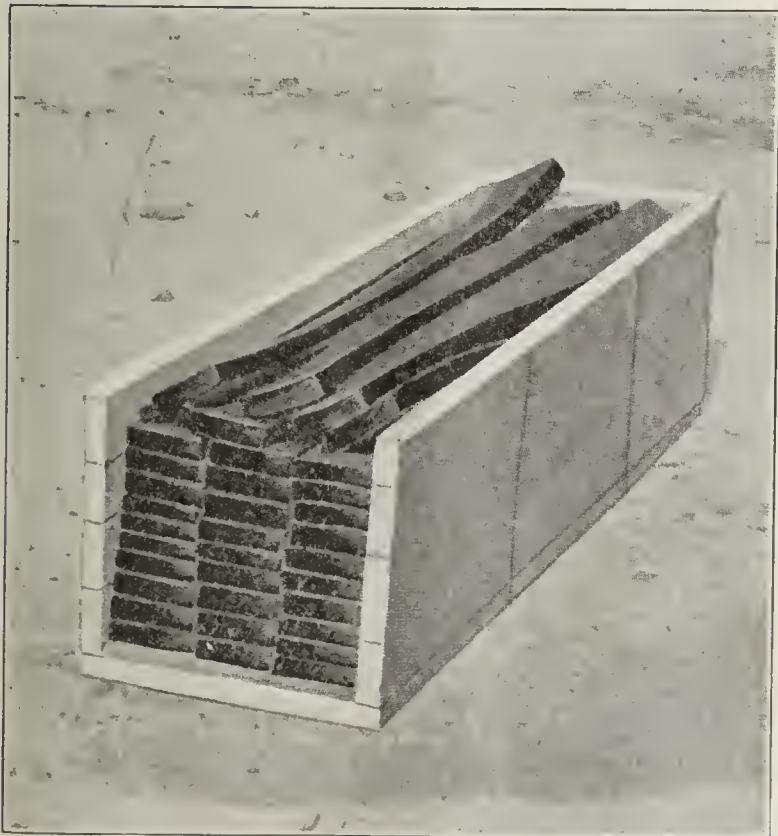
SPUR GEAR SPEED REDUCERS

Note they are dust proof, compact, made in any horse power or reduction. Just what is needed on conveyors, elevators and reduction of speed anywhere. **We manufacture cut gears.** Send for catalogue.

Foote Bros. Gear & M. Co.

210 to 220 N. Carpenter St., Chicago

Genasco Expansion Joints



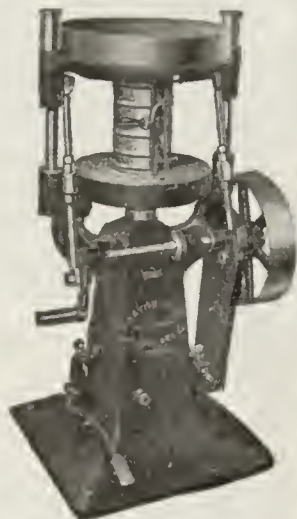
have all the advantages of other prepared joints for concrete, wood-block, brick and granite-block pavements—**economy, ease of installation, the avoiding of melting and pouring**—and besides this

Are All Asphalt

The **entire thickness** of a Genasco joint serves the purposes of expansion and contraction. Ready-made joints that contain felt or some other form of re-enforcement cannot do the work of the Genasco all-asphalt joint. Any thickness or depth.

The best way to judge this joint is to see it. A life-sized sample will be sent to any one interested. Write for it today.

THE BARBER ASPHALT PAVING COMPANY
Philadelphia, Penna.



The Reason Why You Are Not Making Cement Drain Tile Is Because You Have Not Yet Investigated Its Possibilities

The superiority of cement tile for drainage purposes is known; there is no competition in quality or price. For this reason its future use is assured, as well as its present use.

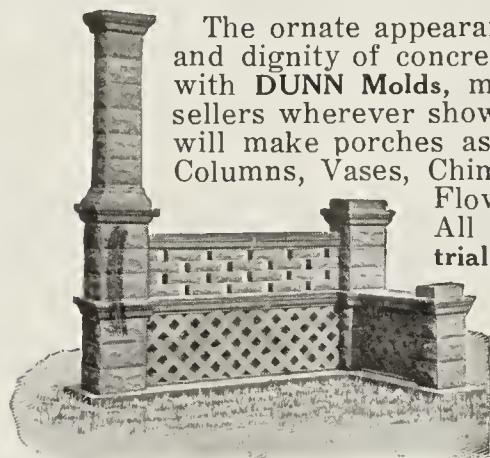
The cement drain tile business does not require a large investment—nor skilled labor—nor hard selling. A few hundred dollars will start you right; you can use unskilled labor; you can sell all the tile you manufacture without any difficulty.

And we are prepared to guarantee profits ranging from \$230 to \$800 a month.

Ask us today for printed proof of comparative costs and profits in making tile; we send this information free upon request.

Dunn equipment is sold on 15 days' trial; write for the tile equipment catalog. Price of Dunn No. 1 Tile Machine. **\$165**

Concrete Porches Pay a Bigger Profit Than You Think.



The ornate appearance, permanence and dignity of concrete porches made with DUNN Molds, make them ready sellers wherever shown. Dunn Molds will make porches as illustrated, also Columns, Vases, Chimneys, Balusters; Flower Boxes, etc. All sold on 15 days' trial.

Write for Porch Mold catalog today. Price of outfit for making porch as shown,

\$39



Don't Tamp Sewer Pipe—POUR IT!

Tamping a semi-dry mixture, to make large drain tile and sewer pipe, is not only slow, troublesome and costly—but unnecessary. Pouring a wet mixture into DUNN Molds, besides being the most efficient method, assures the strongest product. Reduces manufacturing costs, too, and increases the profits.

Dunn Molds permit the manufacture of all size pipe, from 6 to 36 inches in diameter. All sold on 15 days' trial: Pipe Mold catalog gives full descriptions and prices, ask for a copy. Price of 12-inch mold. **\$7.50**



Here's Mixer Value Out of the Ordinary

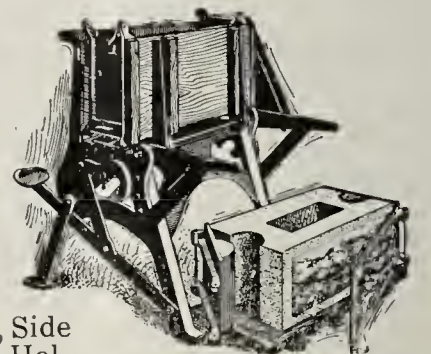
Let facts—not claims—influence your buying judgment. You buy concrete mixers because of what they are, not because of what they are claimed to be. To learn about the Dunn construction is to learn the reasons why a DUNN Mixer is the mixer you have waited for.

Dunn Mixers have four mixing blades and extra long drums, giving them the highest possible mixing efficiency. The convenient loading height and the power discharge feature, save labor. Their capacity—a batch a minute—is assurance of ample speed. The one-piece hollow yoke makes the operation almost noiseless. The all steel and iron construction is evidence of long life.

Write today for catalog describing all styles and sizes. We sell on 15 days' trial. Prices

\$67.50 to \$224

Use Three Block Machines—but Buy only ONE



To make Face Down, Side Face and Two-Piece Hollow Wall Cement Blocks usually requires three machines. But one DUNN Combination Cement Block Machine will make all three types. Saves two-thirds the usual investment.

By using a wet mixture it saves considerable tamping, and makes a stronger block. And a special off-bearing system protects each block against breakage. Capacity, 150 blocks daily.

Sold on 15 days' trial. Write for Block Machine catalog. Price

\$40

The Concrete Fence Posts that Sell the Quickest



Are those of high quality and moderate price. These are the kind that DUNN Fence Post Molds made. The Dunn system enables quick and economical manufacturing. Tamping is eliminated by our special Vibratory Base which compacts each post to uniform density and firmness. Made in batteries of four and ten. Sold on 15 days' trial. Price of 4-mold battery

\$12.50



W. E. Dunn Mfg. Co.
4139 Fillmore St., Chicago



Compactness and Sturdiness Mean Greater Efficiency



The "Excelsior"

was designed and built to set a fast pace for the higher priced mixers and contractors say it does.

Equipped with low hopper; friction clutch; dust proof bearings; 3 H. P. engine. Can be equipped with hoist at small additional cost. Capacity $4\frac{1}{2}$ feet mixed material per batch; easily 65 cu. yds. per day.

Write for illustrated catalog and judge for yourself the extra value of the EXCELSIOR.

Good territory open for agents

Excelsior Mixer & Machinery Co.

606 Merrill Bldg.

Milwaukee, Wis.

AGENTS: Universal Steel Products Co., Chicago, Ill. L. & D. P. Smith, Valdosta, Ga. Loyal Power Co., Omaha, Neb. Manufacturers Supply Co., Minneapolis, Minn. Ward Equipment Co., Pittsburgh, Pa. E. W. Ripley, Farmington, Me.

There's Sense in Steel

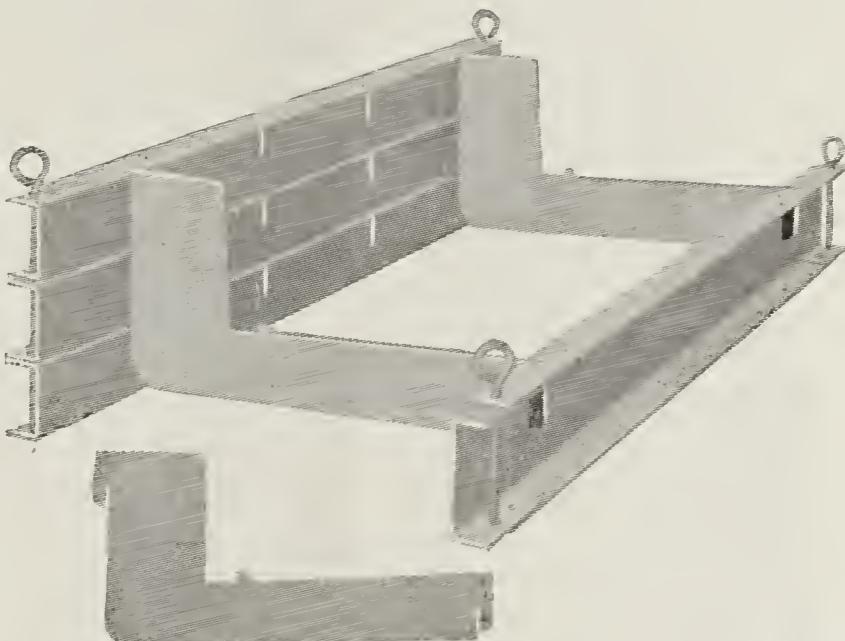
just as well as there are cents in the use of
Indiana Steel Forms.

For **\$13.⁷⁵**



you can buy enough Indiana Steel Side-walk Forms to lay 78 running feet of walk 4' or 5' wide per day.

The sense of buying these particular **steel** forms for your work lies in the fact that the same forms can also be used for curb and gutter construction by simply adding the curb and gutter steel dividing plate.



Steel Forms mean permanent equipment. That's why many of the largest and smallest contractors are using **steel** forms in place of wood.

Steel means smooth, clean work. Indiana Steel Forms are simple in construction. No wedges, pins, ratchets, bolts or nuts to bother with. You will see the advantage of them after a try out.



You Can't Overlook the Above Offer

It is limited, so better write for more particulars right now. Surely you cannot afford to putter along with wood forms when you can buy **steel** forms at this price.

Write for Our Literature

Indiana Concrete Mold Co.

216 East River St.,

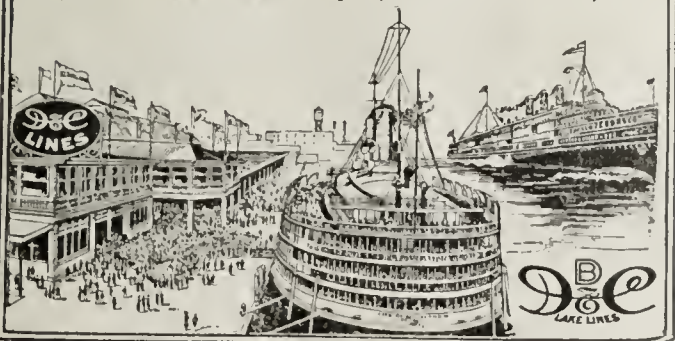
Peru, Indiana

THE COAST LINE TO MACKINAC DETROIT, TOLEDO, CLEVELAND, BUFFALO, PT. HURON, ALPENA, NIAGARA FALLS, ST. IGNACE.

A LAKE TRIP FOR REST AND RECREATION

Have a real vacation on the Great Lakes, the most enjoyable and economical outing in America. The cool lake breezes, the ever-changing scenes along the shore, and the luxurious steamers of the D. & C. Line are positive guarantees that you will enjoy every minute of your trip, and return home refreshed and glad you went. Daily service between Detroit and Cleveland and Detroit and Buffalo. Four trips weekly from Toledo and Detroit to Mackinac Island and way ports. Two trips weekly, special steamer, Cleveland to Mackinac Island, no stops enroute except Detroit and Alpena. Special day trips between Detroit and Cleveland during July and August. Daily service between Toledo and Put-in-Bay. RAILROAD TICKETS AVAILABLE FOR TRANSPORTATION on D. & C. Steamers between Detroit and Buffalo or Detroit and Cleveland either direction. Send two-cent stamp for illustrated pamphlet and Great Lakes map. Address L. G. Lewis, G.P.A., Detroit, Mich.

Detroit & Cleveland Navigation Company
Philip H. McMillan, Pres., A. A. Schantz, V.P. & G.M.
All Steamers arrive and depart, Third Ave. wharf, Det.



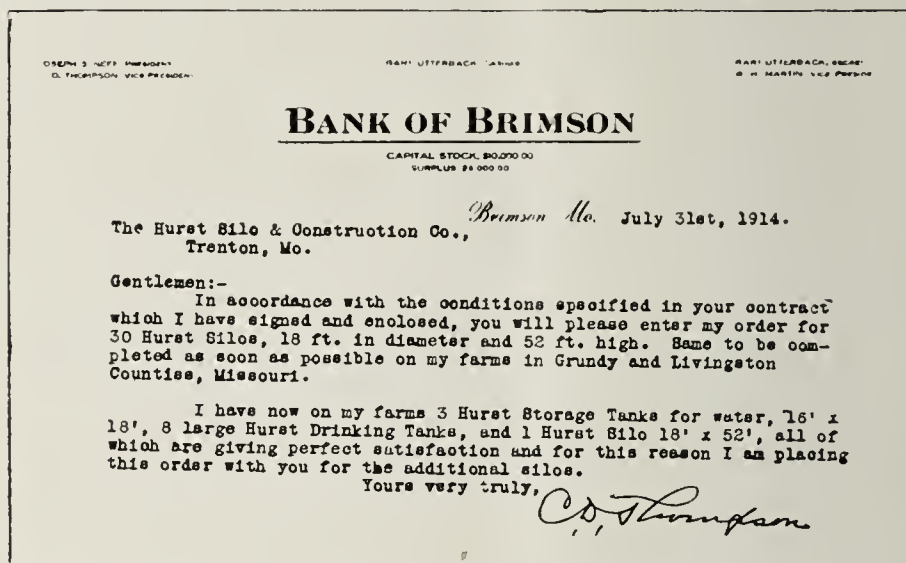
HURST SILO

TEN YEARS AND NOT A FAILURE!

That's the Record



The largest order ever given in the U. S. for Concrete Silos. C. D. Thompson, of Trenton, Mo., places his order for 30 Hurst Silos, 18 feet in diameter and 52 feet high.



Hurst Silos are built of reinforced concrete blocks, made in Hurst Patented Molds using the poured system—a dense block water-proof and of tremendous crushing resistance.

The Hurst System of Silo Construction will interest you. It is inexpensive and enables anyone to turn an investment into quick money. Farmers recognize the Hurst Silos as a sure and safe investment.

What The Hurst Silo & Construction Company, builders of Hurst Silos, write us will interest you. Read it: July 31st, 1914 we purchased the exclusive right to manufacture Hurst Silos and Tanks in 35 counties in Missouri and 5 in Colorado.

August 1st we commenced our factory at Trenton. August 14th we were making blocks. October 22d we had erected 15 silos with 3 more delivered ready for erection, with 4500 blocks curing in the yard.

This, in spite of the fact that we had no salesman employed and did not get started before most silo firms had discontinued business for the winter.

To take care of our business we expect to establish 6 to 10 factories in our territory, each with a capacity of one silo per day.

Our molds, having a capacity of 1 silo per day, cost us less than \$1000.

The Hurst System of reinforced concrete construction reduces to the minimum time, labor, expense and competition.

We have some more openings for live, responsible parties, but they are going fast. Don't put it off, but act now.

Write for Particulars and Catalogue

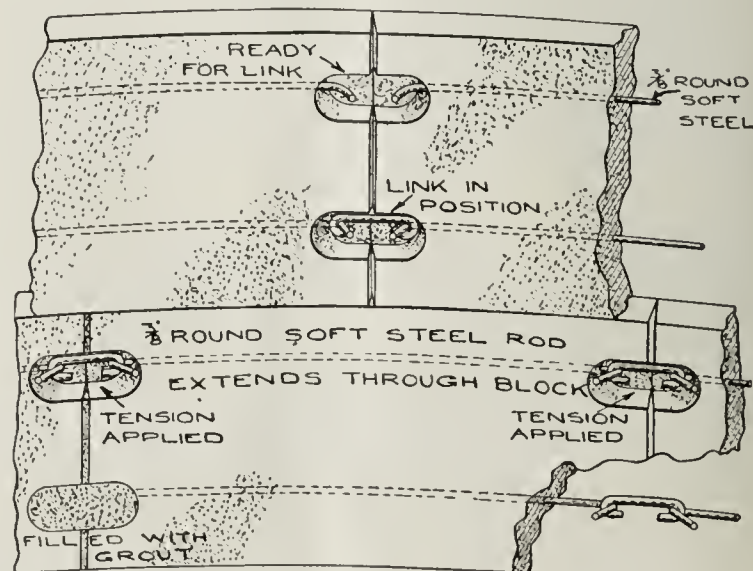
The Chas. B. Hurst Company

Established 1904

819-829 Exchange Ave.

Union Stock Yards

Chicago



The HURST Reinforced Block for Tank and Silo Constructions

TO CONTRACTORS: A TALK ON FARMERS, AUTO- MOBILES, SILOS AND THE P—— S——

ONCE there were three farmers. Greene bought an automobile, Gray bought a monolithic concrete silo, and White bought both. The only moral to this story is that there ought to be a monolithic concrete silo on every farm that supports an automobile. And there will be before long.

THE ONLY thing that concerns YOU and US is getting the silo to the farmer. We shall have to deal with every farmer who feels the pressure of the increased cost of living. We shall have something that he needs.

A GOOD monolithic concrete silo will give the farmer a return of from 30% to 50% on his investment each year of its existence (which is a mighty long time). Progressive farmers know this now, others will know it soon. THE ONLY THING IMPEDING EXTENSIVE BUILDING OF CONCRETE SILOS IS THE "FEWNESS" OF CONTRACTORS EQUIPPED TO BUILD THEM. You ought to see the letters that we get.

THE POLK SYSTEM means BUSINESS, a big, steady, profitable business for you. The season is now in full blast. Call for a postal card right this minute. The fifteen seconds that you spend in making the inquiry will be the best quarter of a minute that you ever experienced. All wise contractors get acquainted with the POLK SYSTEM.

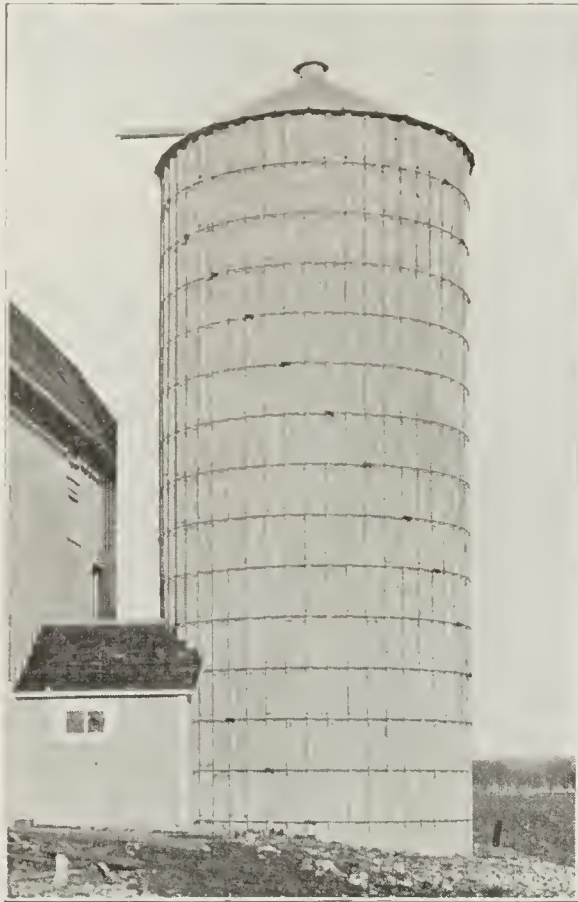
THE POLK SYSTEM RENDERS the SERVICE

Polk-Genung-Polk Co.

Fort Branch, Indiana

A New Principle Invented in Cement Stave Silo Construction A Needed Improvement. Silos, Tanks, Etc., Built Any Size Desired

Mr. S. T. Playford, the originator of cement stave silos, has purchased an absolutely new type of silo. Those who have seen it—and who have made searching comparison with Mr. Playford's earlier efforts in cement stave silos, are united in saying that this invention creates a new standard by which silos must now be judged. This new silo will be known as the S-T-P. The S-T-P Silo embodies the latest, up-to-date knowledge and experience in silo building. Being a new silo, we are not forced to cling to old ideas, patterns and machinery. We have in the most original manner produced a silo that is strikingly different—a silo of incomparable strength and matchless durability and efficiency. The S-T-P will enable you as a contractor to offer an A-No. 1 business proposition to the farmer. The



S-T-P Silo

"SILO THAT'S PERFECT"—Invented by W. A. Hillman

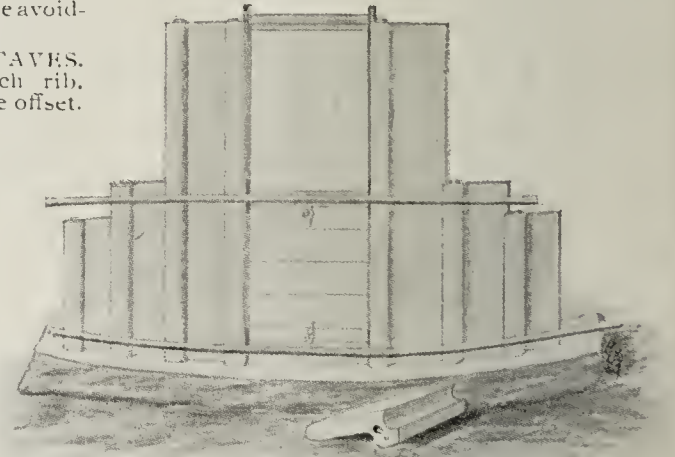
The more you know about silos, the more you will appreciate the S-T-P. The less you know about silos the more important it is that you learn about the "S-T-P." It means the avoidance of dissatisfaction and money losses.

The "S-T-P" is made of SLUSHED STAVES. Thoroughly reinforced. Has a 4½ inch rib. Pointed up on the outside. The hoops are offset. This to give a ladder to work upon.

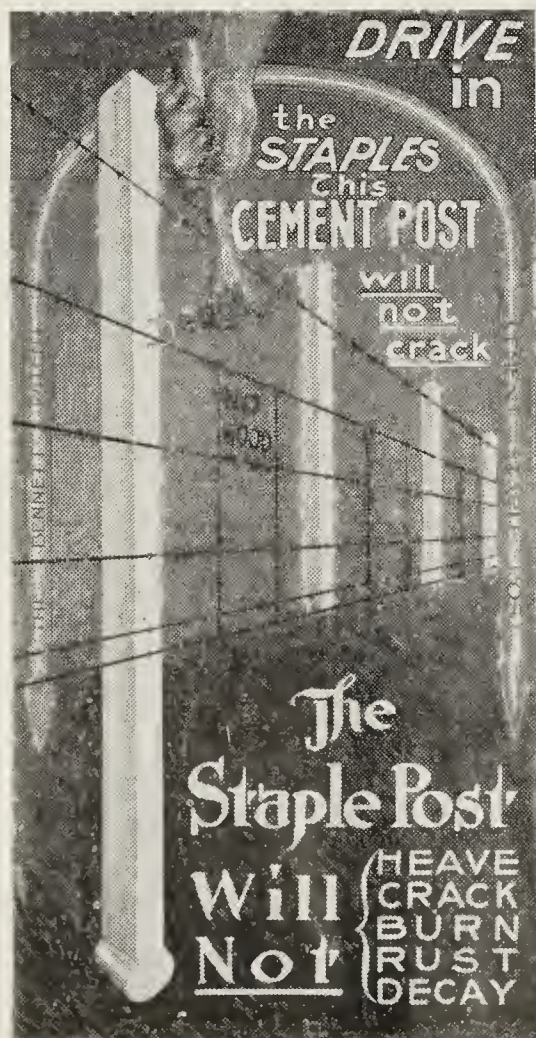
*Write for circular,
prices and further
information*

**PLAYFORD
MFG. CO.**

298 Douglas Avenue
ELGIN, ILLINOIS



Minnesota Cement Construction Co., Long Prairie, Minn. Andrew Nordloef, Mgr. for Minnesota, No. and So. Dakota, Iowa Nebraska and Wisconsin



Staple Post Mold Co.
454 W. Home St., WESTERVILLE, OHIO

An Everlasting Cement Post

INTO WHICH

Staples Are Driven

The same as into wood. In use since 1906 and absolutely practical

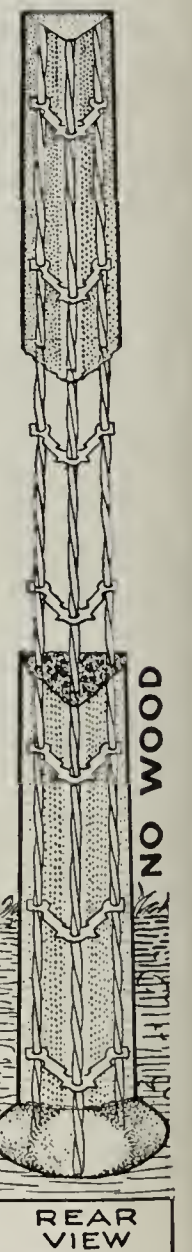
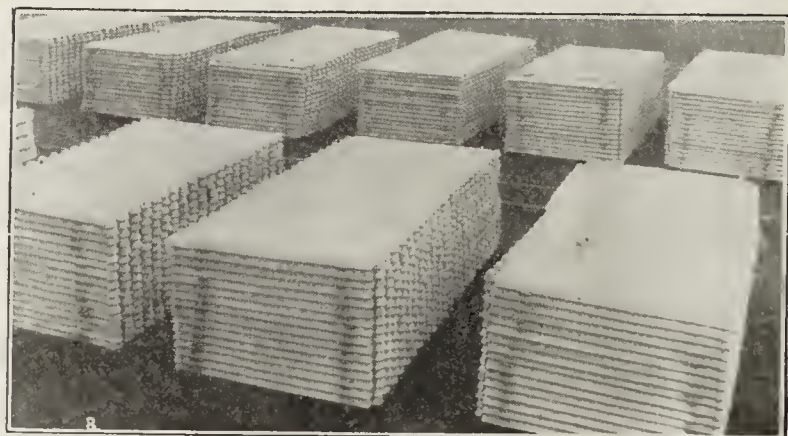
The Staples Hold

SEE THE REINFORCEMENTS

Strongest known to Engineers—Not a single complaint of posts breaking off at ground line—Lightest, strongest, easiest to make—compete with wood posts in many places.

MAKE STAPLE POSTS

A splendid opportunity for men of business and capital
Investigate and be convinced





MEDUSA WHITE PORTLAND CEMENT

THE FIRST TRUE WHITE PORTLAND EVER MANUFACTURED

MEDUSA is unexcelled for building ornamentation, stucco, concrete building blocks, interior decoration, statuary, cemetery work, parks and grounds, tile, mosaic, setting marble, limestone or brick, etc. It can be used for exterior as well as interior work, and with it results rivaling that of the best white marble can be obtained.

The U. S. Government has used Medusa White in many Post Offices and other buildings, which should be conclusive evidence of its high quality. It is guaranteed to be a high-testing Portland passing standard specifications. Give Medusa a trial and be convinced of its superior quality.

Don't fail to write for our new booklet of illustrations and testimonials

SANDUSKY PORTLAND CEMENT CO.
SANDUSKY, OHIO



FRENCH'S PORTLAND CEMENT

Samuel H. French & Co.
PHILADELPHIA

HIGHEST STANDARD

Established 1844

DANIEL B. LUTEN

INDIANAPOLIS

Designing and Consulting Engineer

Reinforced Concrete Bridges Exclusively

Associate Engineers in each State

The Post that Will Not Rust, Rot, Break or Burn, but Gets Better Every Year

PATENT NO. 1,107,406

THE UNIVERSAL CEMENT POST

is the only cement post to which a plank fence may be attached without the use of a single nail. It is the only cement post which holds the fence in such a manner that it is impossible for cattle to ride it down, or hogs to go under it.

Further, it is the only cement post for building speedway and ball park enclosures; fastening of boards is an easy matter.

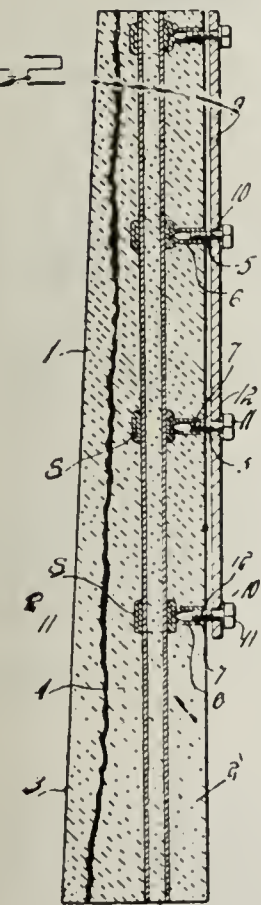
This post will not break at the ground. Our special process of reinforcing takes good care of that part. Can be made in any shape, design or length to match any design one may want to carry out.

The Universal Cement Post is the only all-feature post on the market. Large corporations want this post. A live state agent is wanted to take care of the demands for this post in each state and Canada.

My mutual plans will be profitable to all concerned. Write at once. Address all correspondence to

F. W. GOTTLIEB

General Agent
MORRISTOWN, INDIANA



SERIAL NO. 829,291

It is only natural for a cement user to be prejudiced in favor of a Portland Cement that has given him satisfaction for many years.

This is doubtless the reason why so many contractors demand

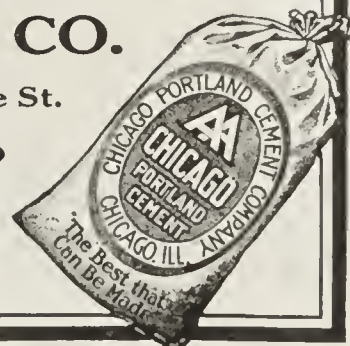
CHICAGO-AA

especially for all exposed work where both quality and appearance are of importance.

CHICAGO PORTLAND CEMENT CO.

30 N. La Salle St.

Chicago



Bulk Cement Saves Users' Money

The Chicago & Alton Railroad found bulk cement so satisfactory in two season's experience in track elevation work that the chief engineer recommended it to Westinghouse-Church Kerr & Co. when they started work on the Chicago & Alton Shops at Bloomington.

Investigation showed that no special equipment or storage bins were required. Cement was shoveled directly from the car into a measuring box, pivoted and gated at one end for emptying into a wheelbarrow. The concrete foreman stated that the one man in the car and the one cement wheeler could have handled much more cement than was required for the 100 cubic yards per day of concrete used.

With cement in bulk no money is tied up in sacks nor are any sacks lost, stolen or damaged on the job. All labor connected with sacks is eliminated, namely, unloading from car to storage shed, wheeling from shed to mixer, untying and emptying sacks at the mixer platform, and counting, bundling, checking and shipping empty sacks. The net cost of bulk cement is 2 cents less per barrel than the net cost in cloth. These savings total from 7 cents to 12 cents per barrel of cement used.

While the installation of an elevator and gravity bin for handling bulk cement is not necessary, such special equipment will result in still greater economy.

For information on this subject write for a copy of

"THE ECONOMY OF BULK CEMENT"



Unloading and Measuring Bulk Cement



UNIVERSAL Portland Cement Co.

— OFFICES: —

CHICAGO : : : : 208 South La Salle Street
PITTSBURGH : : : : : Frick Building
MINNEAPOLIS : : : : : Security Building

12,000,000 Barrels
Annually

Plants at Chicago
and Pittsburgh

CONCRETE FOR PERMANENCE

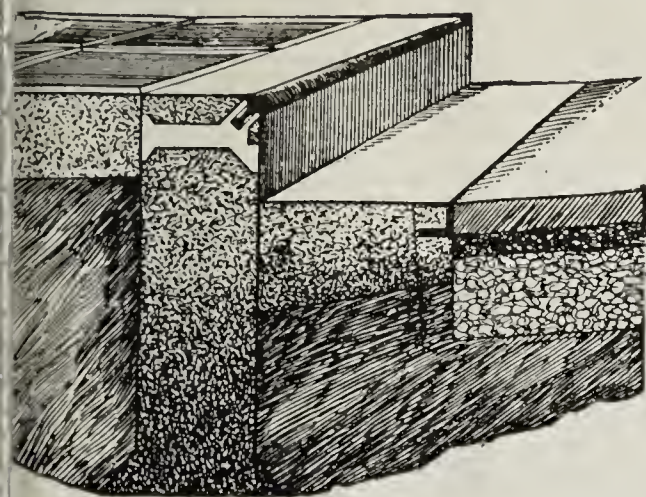
WAINWRIGHT STEEL-BOUND CONCRETE CURB

HAS A RECORD OF
SIXTEEN YEARS' USE WITHOUT A FAILURE
ABSOLUTELY NON-BREAKABLE. CHEAPER THAN GRANITE

THIS CURB WILL STAND HARDER
USE AND LAST TEN TIMES AS LONG
AS PLAIN CONCRETE CURBING

"WAINWRIGHT
PATENTS"

March 9, 1897
November 22, 1898
May 5, 1903
March 26, 1907
August 29, 1907
August 2, 1910



GALVANIZED STEEL CORNER BAR PREVENTS
CHIPPING OR BREAKING ON
EDGES

OVER
EIGHT MILLION
FEET

IN USE IN MORE THAN
FIVE HUNDRED CITIES
IN THE UNITED STATES



MECHANICALLY PERFECT AND
UNEQUALLED FOR CURVED
CORNERS

THE WAINWRIGHT GALVANIZED STEEL CORNER BAR

IS THE ONLY BAR THAT CAN BE DEPENDED ON TO PERMANENTLY RETAIN ITS PLACE IN CONCRETE. THE RECOGNIZED MERITS OF THE WAINWRIGHT BAR HAVE MADE IT THE STANDARD CORNER BAR FOR CONCRETE PROTECTION, AND IT HAS BEEN SPECIFIED FOR YEARS BY THE UNITED STATES GOVERNMENT, LEADING CITY ENGINEERS, RAILROAD OFFICIALS AND RESPONSIBLE CONTRACTORS.

THIS BAR IS SELF-ANCHORING. THE DOVETAILED WEB HOLDING IT FIRMLY IN PLACE EVERY INCH OF ITS LENGTH, PRESENTING A RESISTING DEPTH OF TWO INCHES OF SOLID STEEL, AT EVERY POSSIBLE POINT OF IMPACT.

THE SUPERIORITY OF THE WAINWRIGHT GALVANIZED STEEL CORNER BAR OVER COMPETING DEVICES IS DUE TO THE SOLID ROUNDED HEAD AND CONTINUOUS INTEGRAL ANCHORAGE, ALSO GREATER WEIGHT OF RESISTING MATERIAL.

FROST WILL NOT DISPLACE THE WAINWRIGHT BAR AS IT
WILL ANY BAR ANCHORED AT INTERVALS

SEND FOR BOOKLET NO. 4

STEEL PROTECTED CONCRETE CO.

Real Estate Trust Bldg., PHILADELPHIA, PA.

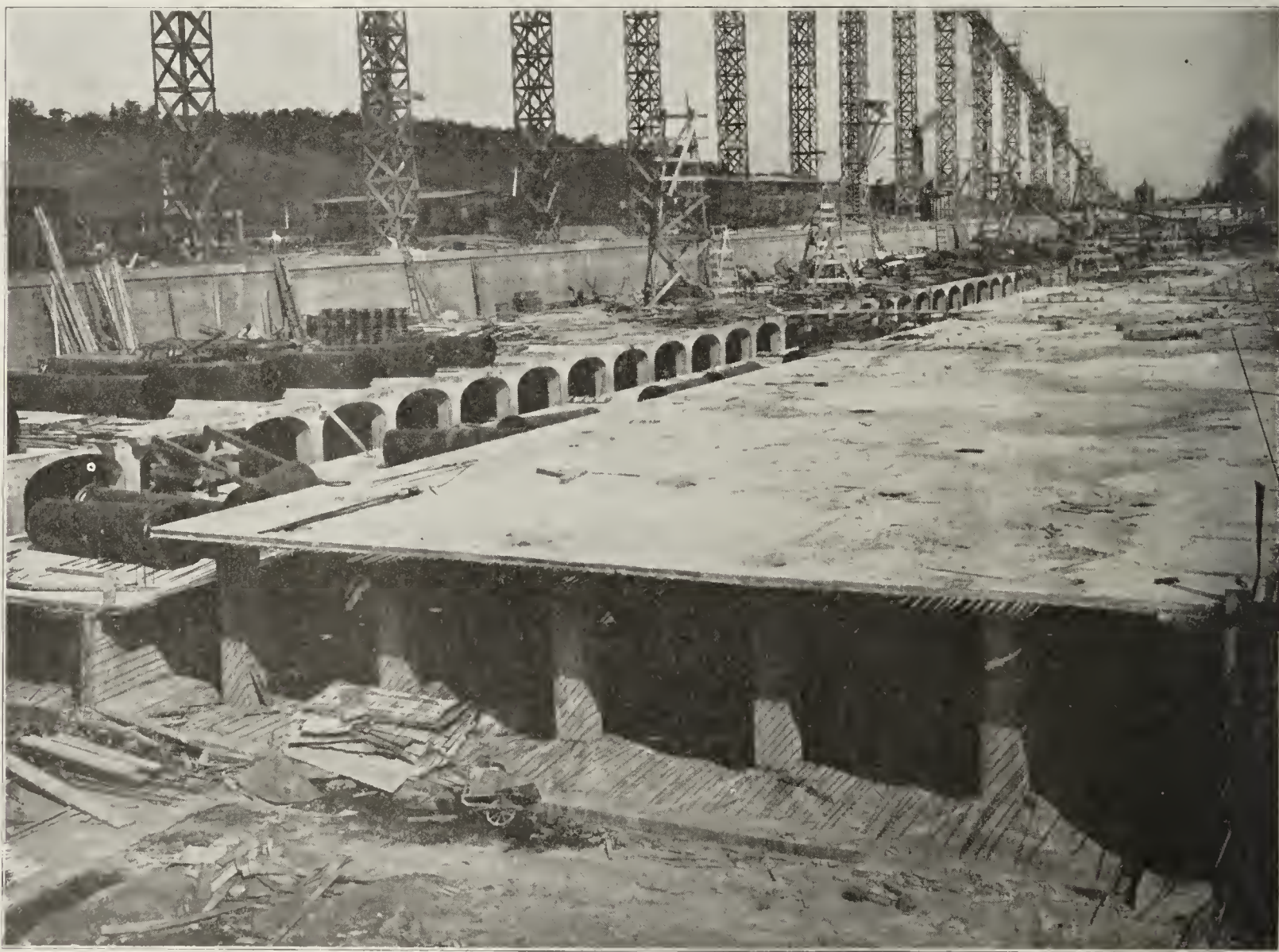
HYDRATED LIME

added to concrete makes it denser, stronger and watertight

D R. E. W. Lazell, the well known lime expert, says: "The denser the mortar or concrete, the greater the strength, other factors being equal. This fact is, I think, generally admitted. If, then, hydrated lime increases the density, the strength of the mortar or concrete must be increased. The question therefore resolves itself into proving whether or not hydrated lime increases the density.

"It is well known that mortars composed of Portland cement and sand are harsh working and non-plastic, that is, they are not easily molded or troweled. These harsh mortars require considerable manual work to mold or to form into any given shape. The addition of hydrated lime overcomes this harshness, rendering the mortar more plastic. It must therefore follow that the same amount of manual labor in molding or troweling will produce a denser mass.

"In the writer's opinion, the greatest advantage of the use of hydrated lime is this quality of rendering the mortars more plastic, the increased plasticity resulting in greater density. Exactly the same argument applies to concrete. Concrete containing a small amount of hydrated lime is much more plastic and smoother working than similar concrete containing no hydrate. Because of this greater plasticity the same amount of tamping would result in a denser concrete. The part played by the hydrate is wholly mechanical, imparting greater density to the concrete. It is further a well known fact that lime paste tends to retain its mechanically mixed water, thus hydrated lime retards the drying out of both mortar and concrete and supplies the water necessary for the full development of the strength of the cement. This quality of hydrated lime is particularly valuable when used in cement mortar, since the affinity of the hydrate for water keeps the mass damp and allows the cement to gain its full strength."



St. Louis Builds World's Largest Mechanical Filter Plant

Edward E. Wall, Water Commissioner, St. Louis, Mo., says:

"The design provides for forty 4,000,000 gallon daily filter units, each 50 x 28 ft. in plan, supported on concrete columns 20 in. square, spaced 11 ft. on centers north and south and 10 ft. 3 ins. on centers east and west.

"On the original basin floor inverted concrete arches were laid to distribute the foundation loads of the columns. The filter boxes rest on the reinforced concrete floor formed by leveling up the groined arches joining the tops of the columns. Each filter box is poured as a monolith, the concrete mixture being 1:2:4, with 25 lb. of HYDRATED LIME ADDED FOR EACH BARREL OF CEMENT, FOR THE PURPOSE OF MAKING THE BOXES WATERTIGHT."

HYDRATED LIME



What it is and How it is used with Portland Cement

Hydrated Lime is ordinary commercial lime whose affinity for water has been satisfied. In other words, it is slacked lime with the surplus water driven off, leaving a dry, impalpable powder, finer than cement.

When you slake lime in a mortar box on the job, you *hydrate* it. The surplus water in your slaking mixture leaves the lime in putty form.

The value of Hydrated Lime used with Portland cement has long been known to chemists and engineers, but its extensive use in this field is of recent growth.

Lime manufacturers now hydrate their product at the plant and ship it—Hydrated Lime—in 40 or 50 lb. paper bags or 100 lb. burlap bags. Remember, this is a dry, impalpable powder, which can be easily and safely stored. Having been hydrated, there is no fire risk, as additional moisture will not start combustion—a danger encountered in storing commercial lime.

Hydrated Lime, when used in concrete work, helps to fill the voids, producing greater density, which means more nearly waterproof concrete.

Hydrated Lime lightens the color of the concrete, the variation depending, of course, upon the amount of lime used.

Hydrated Lime makes cement mortar more plastic—an important point in stucco work and in brick mortar.

Hydrated Lime enables the concrete to take a clearer impression from molds—the concrete adapts itself to the intricacies of the mold better.

Hydrated Lime lubricates concrete—makes it flow better—for instance, when distributing by chute.

Full detailed information of the methods and cost of using this material may be secured from any of the following competing manufacturers of Hydrated Lime:

Longview Lime Works,
Birmingham, Ala.

Saginaw Lime & Lumber Co.,
Saginaw, Alabama.

Charles Warner Co.,
Wilmington, Del.

Marblehead Lime Co.,
Chicago, Ill.

Ohio & Western Lime Co.,
Huntington, Ind.

Security Cement & Lime Co.,
Hagerstown, Md.

Lee Lime Co.,
Lee, Mass.

Charlevoix Rock Product Co.,
Charlevoix, Mich.

White Marble Lime Co.,
Manistique, Mich.

Glencoe Lime & Cement Co.,
St. Louis, Mo.

Dutchess County Lime Co.,
Dover Plains, N. Y.

Rockland & Rockport Lime Co.,
101 Park Ave., New York, N. Y.

The A. & C. Lime Co.,
Canton, Ohio.

Kelley Island Lime & Transport Co.,
Cleveland, Ohio.

National Lime & Stone Co.,
Carey, Ohio.

John D. Owens & Son Co.,
Owens, Ohio.

Woodville Lime & Cement Co.,
Toledo, Ohio.

National Mortar & Supply Co.,
Pittsburgh, Pa.

Rapid City Gypsum, Lime & Portland Cement Co.,
Rapid City, S. D.

Gager Lime & Mfg. Co.,
Chattanooga, Tenn.

Dittlinger Lime Co.,
New Braunfels, Tex.

Round Rock White Lime Co.,
Round Rock, Tex.

Riverton Lime Co.,
Riverton, Va.

International Lime Co.,
Sumas, Wash.

Standard Lime & Stone Co.,
Fond du Lac, Wis.

Union Lime Co.,
Pabst Bldg., Milwaukee, Wis.

Test and Try Before You Buy

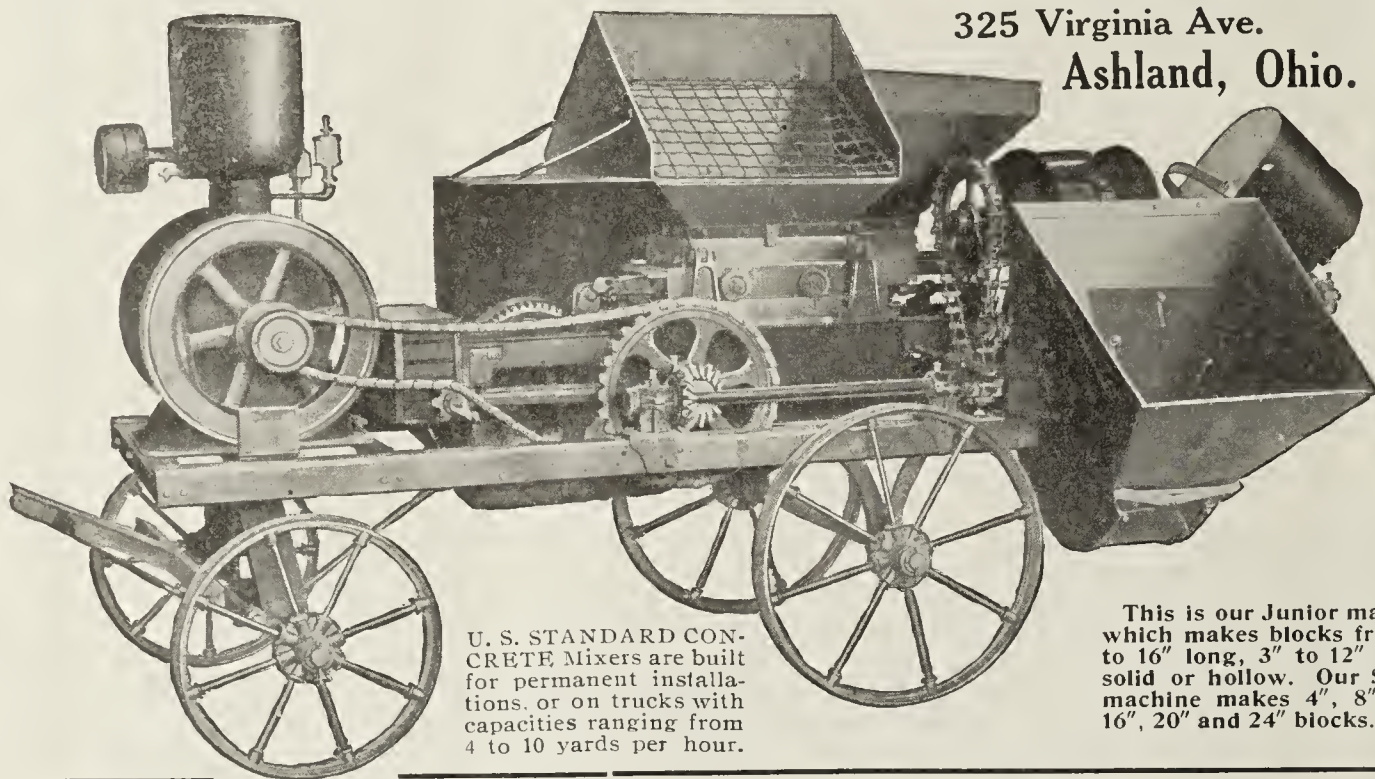
It Is Your Privilege to Test the U. S. STANDARD CONCRETE MIXER Before You Buy

The U. S. STANDARD CONCRETE MIXER is a continuous mixer with a positive measuring, proportioning and feeding device which makes it more accurate than any batch mixer ever made, because it does not depend upon the brain of the operator. It will stand the hardest tests put to it. There are no weak parts in it to cause break-downs, or defective operating parts to cause delay. All parts are interchangeable; workmanship the best. Warranted to embody the most practical and up-to-date working principles. Simple operations change the adjustments to suit any worker. Is giving excellent satisfaction to users. All we ask is a chance to have you try our mixer. We will operate the mixer to your satisfaction on the job, or no sale.

WRITE FOR CATALOG
"A"

U.S. STANDARD MANUFACTURING CO.

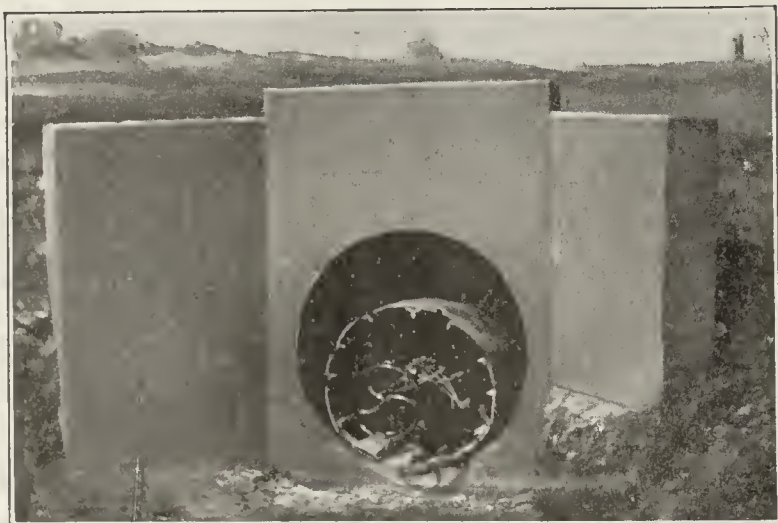
325 Virginia Ave.
Ashland, Ohio.



U. S. STANDARD CON-
CRETE Mixers are built
for permanent installa-
tions, or on trucks with
capacities ranging from
4 to 10 yards per hour.

This is our Junior machine
which makes blocks from 4"
to 16" long, 3" to 12" thick,
solid or hollow. Our Senior
machine makes 4", 8", 12",
16", 20" and 24" blocks.

We also manufacture the famous U. S. STANDARD Block Machine. Turns out solid or veneer blocks, as well as hollow blocks with oval air spaces. It is built in two sizes and is so designed that it handles wet mixture perfectly resulting in a block of unusual density and strength. For speed they cannot be surpassed.



LET US SHOW YOU that there is more money in building concrete culverts over our forms, than in any other branch of your business. One form adjusts to any size from 20 inches to 48 inches in diameter, so you need but one investment for all your culvert work. We also make an arch form, adjusting from 6 to 12 feet. One of these forms will insure you all the culvert building in your vicinity at profits that will exceed any other branch of your contracting. Write at once for free catalog and special offer to contractors.

The Merrillat Culvert Core Co.

Dept. G.

Winfield, Iowa

USE THIS MIXER MR. BUILDER

Absolutely the best mixer for your work that money can buy. Built of steel—is 30 per cent. stronger and half a ton lighter than cast iron mixers of same capacity.

Furnished with two way traction if desired. Back it up to your forms and discharge direct. Saves you time, labor and money. Boss Mixers are equipped with Gearless Power Loader, Hyatt Flexible Roller Bearings and Sectional Chute. Can be furnished with Low Charging Barrow Hopper.

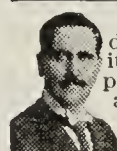
AT AN
ASTONISHINGLY
LOW PRICE

Made in three sizes and driven by gas, steam or electricity. Sold on trial anywhere. Cash or easy payments. Write for catalog, today.

AMERICAN CEMENT MACHINE CO., Inc.
9635 JOHNSON ST. - KEOKUK, IOWA



More Power Less Money 6H \$98.75



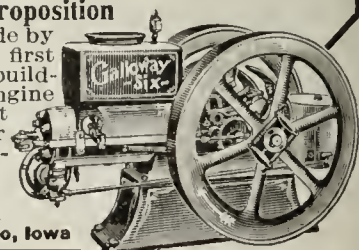
The New Galloway Masterpiece "Six" is the most down-to-the-minute engine that mechanical ingenuity can produce. It is perfectly adapted to furnish power to the shop, the mill, the contractor anywhere and where ready, steady, reliable, efficient and economical power is needed.

My New 1915 Proposition

is the greatest offer ever made by any manufacturer and is the first time in the history of engine building that an A 1 high-grade engine of this h. p. could be bought for so low a price. Write for particulars and price-reducing sliding scale schedule.

Wm. Galloway, Pres.
The Wm. Galloway Co.

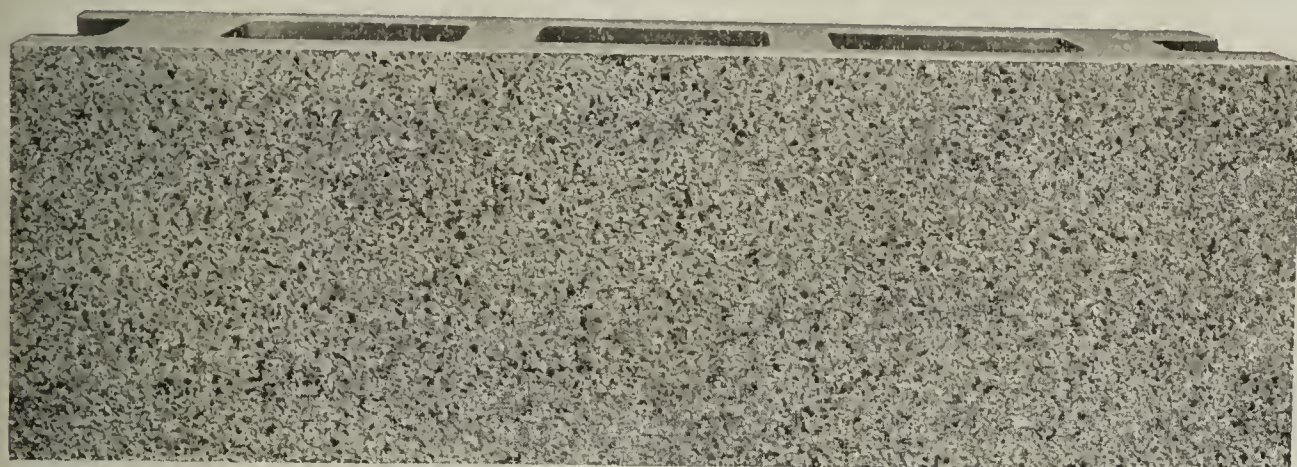
1935 Galloway Station, Waterloo, Iowa



ZAGELMEYER SYSTEM

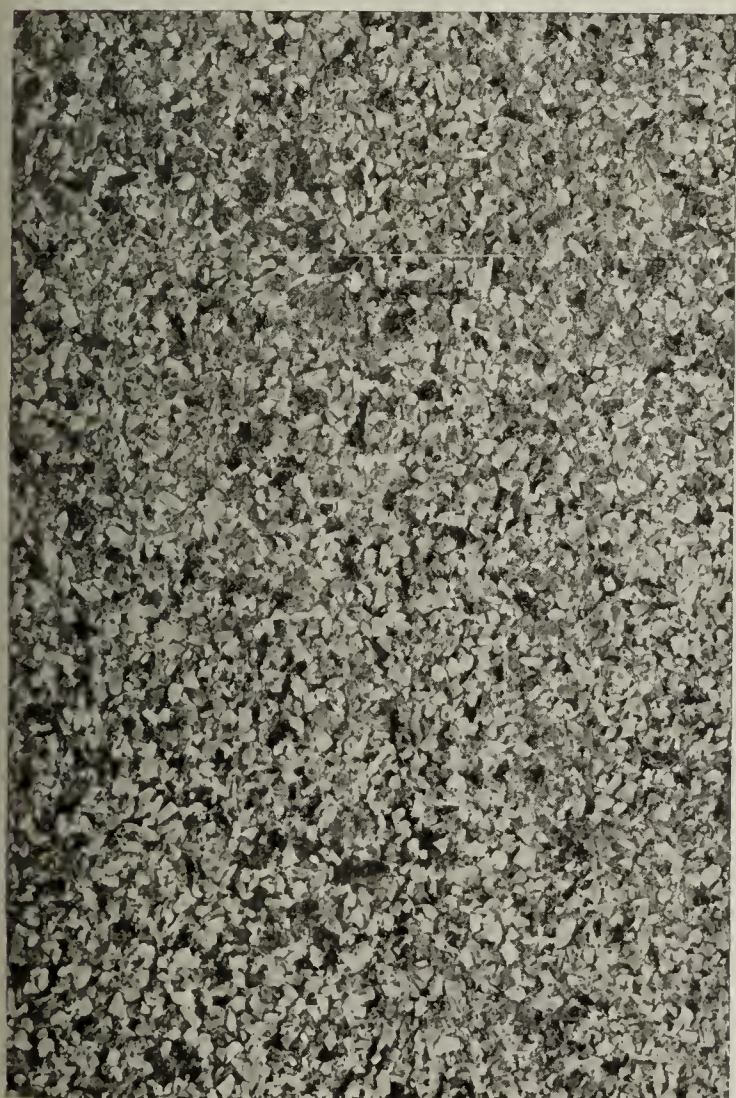
OF CASTING

Hollow Cement Building Blocks WITH GRANITE FACES



8x8x24 inch Granite Smooth Face Block

*They Cost Less
They Sell for More
You Sell More of Them*



Enlarged View of Granite Smooth Facing

BY A NEW process, which protects the facing, while the block is being cast, we eliminate all traces of cement from the face of block and nothing but the GENUINE GRANITE SHOWS IN ALL ITS SPARKLING BEAUTY.

These cuts show blocks just as they came from the molds, they are not treated with acid or scrubbed with brush, or sprayed.

We challenge the whole world to show us a cement block, made by any other system, at any cost, that equals these blocks for beauty, strength, quality or imperviousness to heat, cold or moisture.



8x8x24 inch Granite Rock Face Block

Send us fifty cents and we will send, freight prepaid, to any point in the United States, east of the Mississippi and north of the Ohio Rivers, a granite-faced block, one-half rock-faced and one-half plain-faced. YOU WILL SAY WHEN YOU GET IT THAT YOU NEVER SAW A CEMENT BLOCK BEFORE.

They are positively cheaper to make than the ordinary dry-tamp, sand faced block.

MR. BLOCK MAKER: What show will you have if your competitor secures the exclusive right for this system in your city?

ASK US ABOUT OUR MOLDS FOR MAKING SILO BLOCKS.

Send for a Catalog fully describing our system and showing our multiple molds mounted on trucks, for casting hollow cement building blocks.

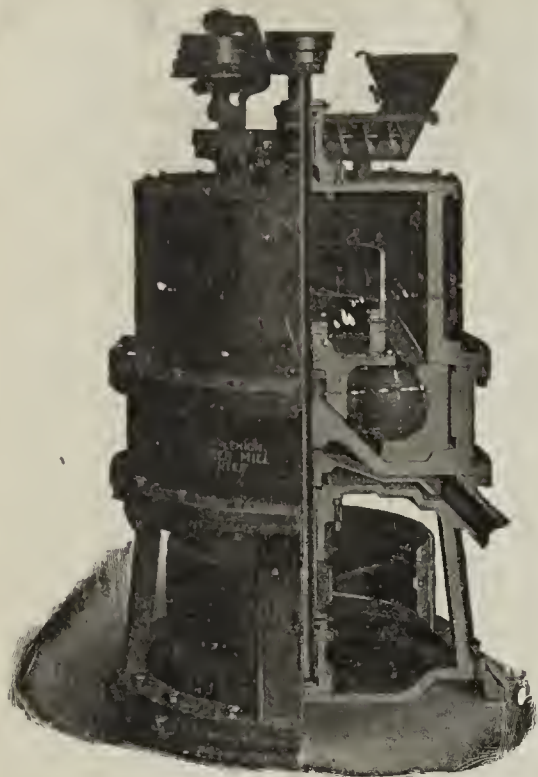
Zagelmeyer Cast Stone Block Machinery Company

25 Crump Avenue

BAY CITY, MICHIGAN

The Fuller-Lehigh Pulverizer Mill.

Produces Commercially



Cement having a higher percentage of Impalpable Powder than can be obtained by any other mill. Tests show that the tensile strength of a 1-5 mortar made with cement pulverized by the Fuller Mill is higher than the tensile strength of a 1-3 mortar made with cement pulverized to the fineness required by the Standard Specifications.

Lehigh Car, Wheel & Axle Works

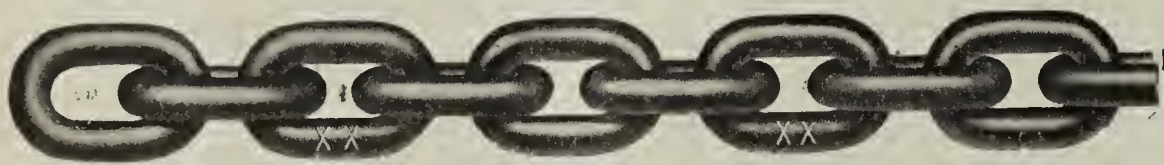
Main Office: Catasauqua, Pa.

New York
N. Y.

Hamburg
Germany

Cement Companies
equipped with
Fuller Mills
advertise the fact that
The consumer
gets
38 pounds more
of the

Impalpable Powder
or
Real Cement
in every barrel of
cement produced by
The Fuller Mill
than by any other.



"OLD RELIABLE" "XX"—Our Motto is "QUALITY FIRST"

You may buy some cheaper grades of Shovel Chain than "XX" but our High Grade "XX" Chain is always cheaper in the end. Send for catalogue and prices.

"OLD RELIABLE"
"XX" SHOVEL CHAIN

Some manufacturers make several grades of so-called Shovel Chain. We make one grade.

Made only by THE HAYDEN CORBETT CHAIN CO.,

Columbus, Ohio

WE CAN MAKE PROMPT SHIPMENTS OF

DU PONT

EXPLOSIVES

AND BLASTING SUPPLIES

DESPITE the present demand for explosives, our facilities for securing materials, the operation of extensive powder plants equipped with special machinery and expert employes, and ample storage and shipping arrangements enable us to promptly and satisfactorily fill all orders.

Over a century's experience in the explosive field gives us a practical knowledge of its requirements. The superiority of our products is recognized by world-wide demands.

Specify DU PONT when purchasing explosives and blasting supplies, and be assured of prompt shipments, uniform quality and maximum efficiency.

DU PONT POWDER CO.

Established 1802

WILMINGTON, DELAWARE

Black

CEMENT AND ENGINEERING NEWS

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JUL 29 1915

Vol. 27

TRANSPORTATION BUILDING, CHICAGO, JULY, 1915

No. 7

F. L. SMIDTH & CO. ENGINEERS

50 CHURCH STREET

NEW YORK CITY

Designers, Equippers and Builders of

Portland-Cement-Making Factories

KRUPP

Grinding
Machinery

THOS. PROSSER & SON

24 Platt St., NEW YORK

Old Colony Bldg., CHICAGO

IMPERVITE

SPECIAL OFFER

You have experimented with many waterproofing compounds containing "Stearates" or other Soaps. IMPERVITE is not a soap; it is the only compound which is an "Asphaltic Emulsion."

One pound of Impervite is better than two pounds of Soap Compound.



We can send you Official Government Tests and scores of enthusiastic letters from Users—but will this SATISFY you?

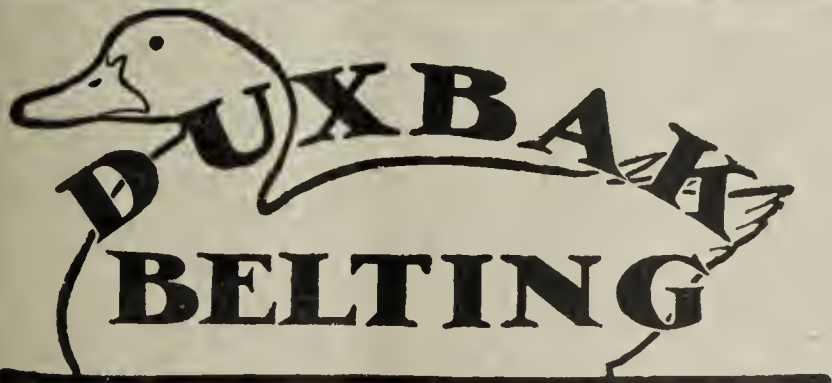
In order to give you an opportunity to PROVE our claims, we are willing to send you 25 pounds of Impervite for \$2.00 (freight prepaid by us) with the understanding that if it does not prove more efficient than the com-

pound you are now using, you will be under no obligation to pay us

We are willing to let YOU be the judge. Write today.

The Standard Paint Co.

NEW YORK BOSTON CHICAGO



TRADE MARK

Chas. A. Schieren Company

ESTABLISHED 1868.

NEW YORK
30-38 Ferry St.

CHICAGO
128 W. Kinzie St.

PITTSBURGH
337 Second Ave.

DENVER
1752 Arapahoe St.

SEATTLE, 620 Fourth Ave.

The Texas Chas. A. Schieren Co., Inc., 106 S. Market St., Dallas, Texas

Tanners
Belt Makers

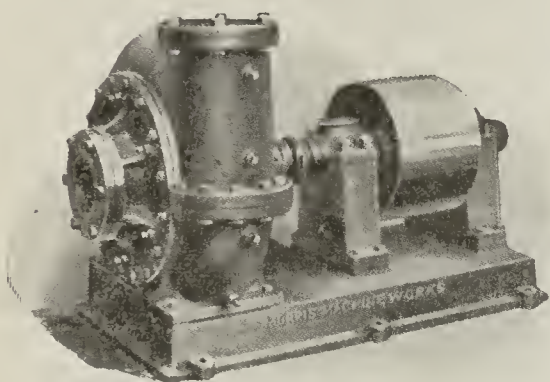
BOSTON
641-643 Atlantic Ave.

PHILADELPHIA
226 North 3rd St.

MORRIS

Solid Lined

Dredging Pumps



EVERYTHING that enters into the construction of the Morris Solid Lined Dredging Pump is of heavy proportions and the general design is such that wear is reduced to the smallest possible extent. Its ability to outlast other dredging pumps is its chief claim to economy.

By removing the upper half of the pump shell, the lining can be taken out or by removing the disc on the pump shell and the inner disc on the lining, the runner can be taken out. The pump is easily and quickly taken apart if necessary to replace lining or piston.

*Write for Sand and
Gravel Pump Catalog*

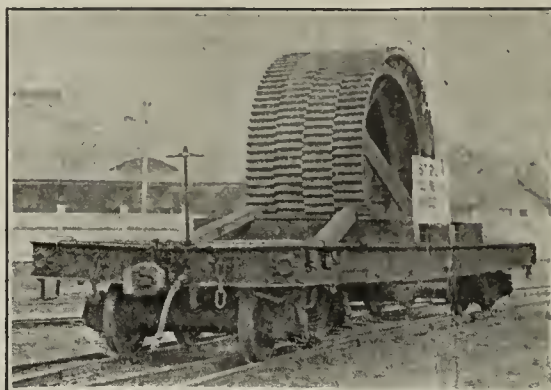
Morris Machine Works

Baldwinsville, N. Y.

NEW YORK OFFICE, 39 Cortlandt Street

HENION & HUBBELL, General Agts.
227 No. Jefferson St., Chicago

Stroh Process



First shipment of gears for Universal-Portland Cement Company's plant of Duluth which is being equipped with Stroh Process Gears and Pinions.

Pinions and Gears

Grinding Plates

Crushing Plates

Track Wheels

Sprockets

Sheaves

Liners

Mantles

Concaves



Trade Mark
Registered

WEAR-PROOF - LOW PRICED



Fracture of
Involute Tooth

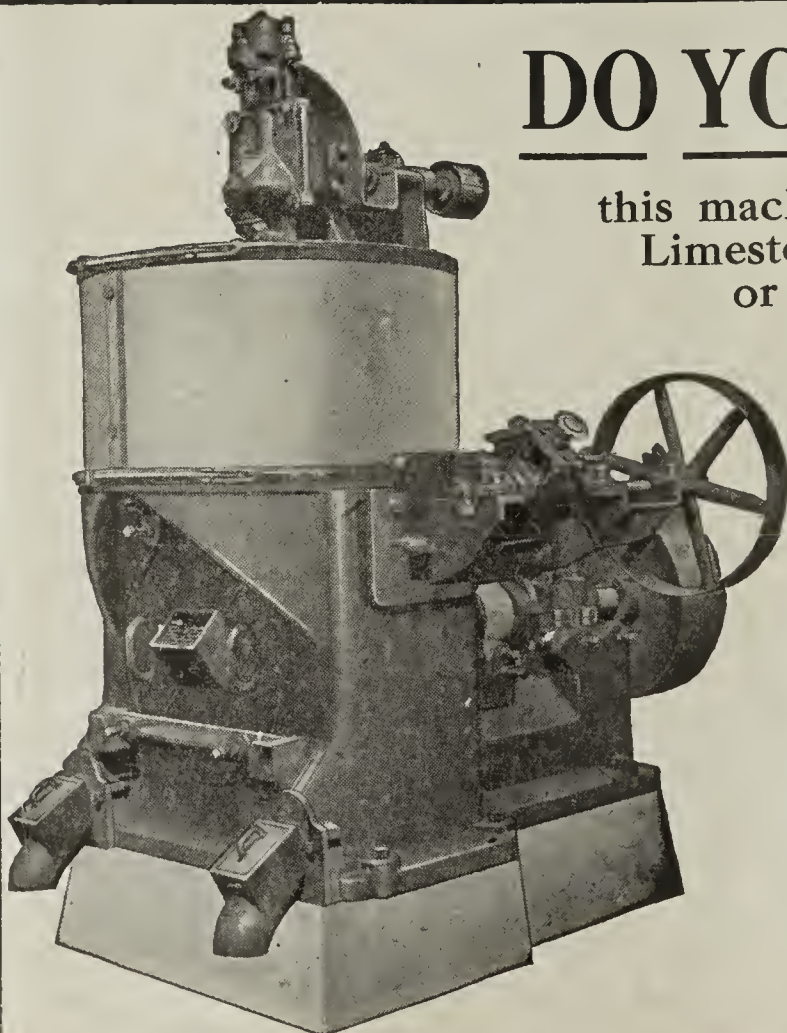
MADE EXCLUSIVELY BY

Kennedy-Stroh Corp.

PITTSBURGH, PA.

DO YOU KNOW

this machine will grind
Limestone, Clinker
or Coal and



FINISH IT
AT ONE OPERATION?

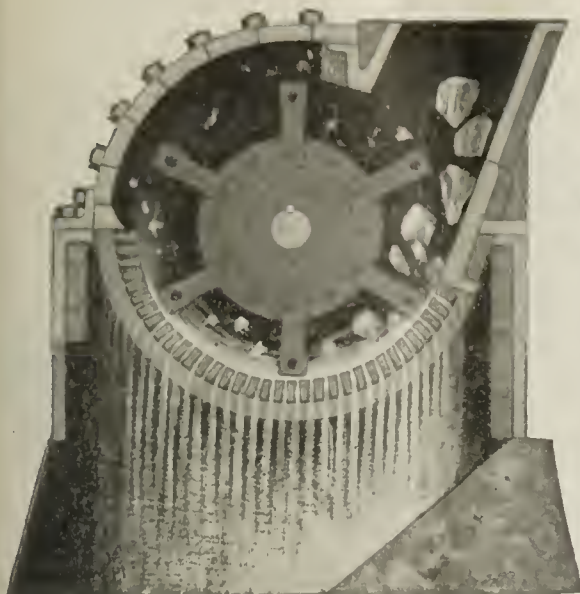
6-8 Tons Limestone
12-15 Bbls. Cement
PER HOUR

**SIMPLIFIES
EQUIPMENT**

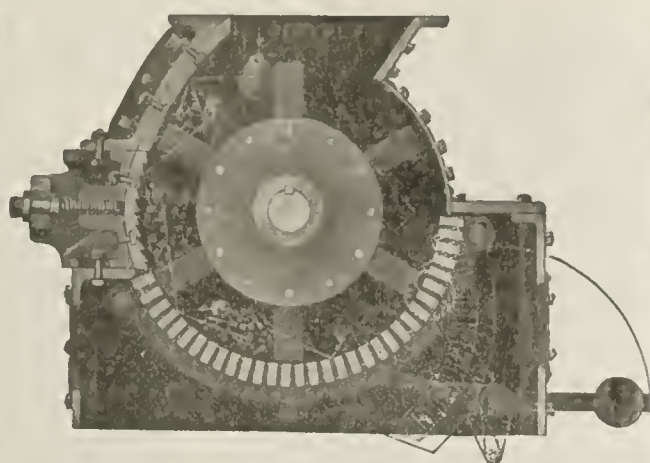
The BONNOT CO.

CANTON, OHIO

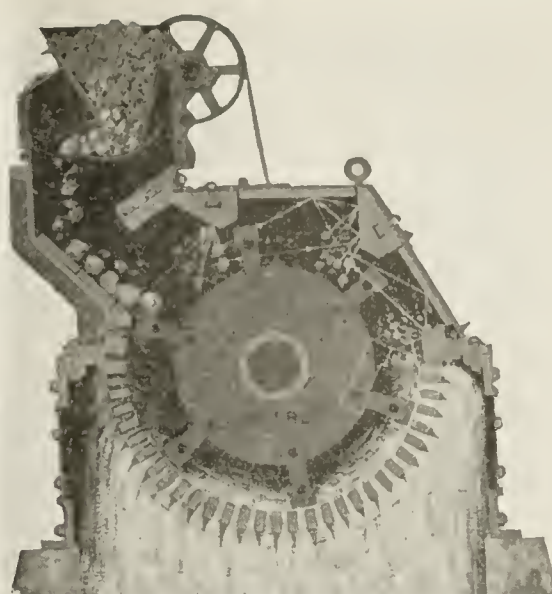
909 New York Life Bldg.
KANSAS CITY - - MO.



Interior view of Jeffrey Type A Pulverizer. A general purpose machine for reducing dry rock products to a moderate degree of fineness.



Section of Type B Pulverizer. Feeds directly upon top of hammers instead of at the side, as in Type A.

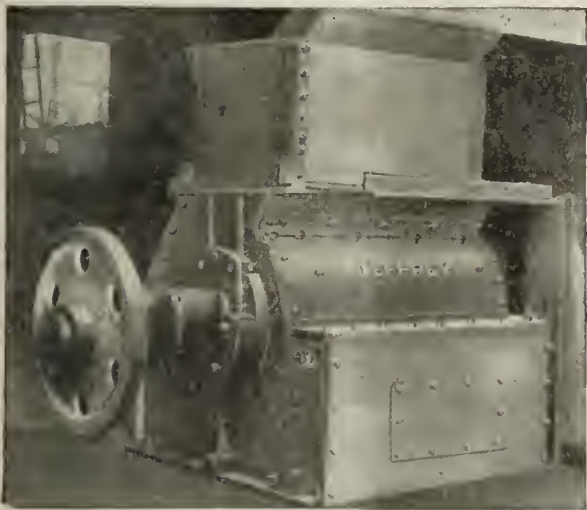


Showing method of feeding and impact crushing with the Jeffrey Type D Pulverizer—the machine for fine grinding of Limestone.

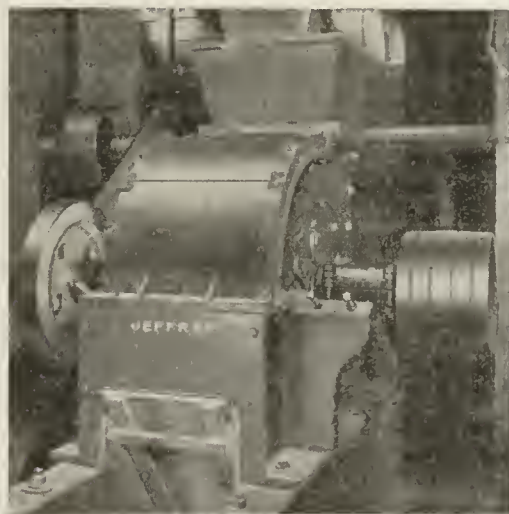
**More than 1000
In Daily Use**

JEFFREY SWING HAMMER PULVERIZERS

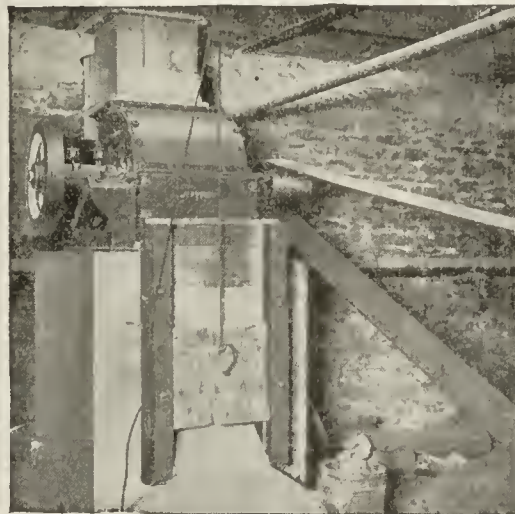
Readily reduce all kinds of friable materials to the proper degree of fineness—with minimum power consumption.



Type B Swing Hammer Pulverizer reducing limestone to $\frac{3}{4}$ -inch and under for manufacturing cement.



Type A Pulverizer reducing gypsum in a cement plaster company.



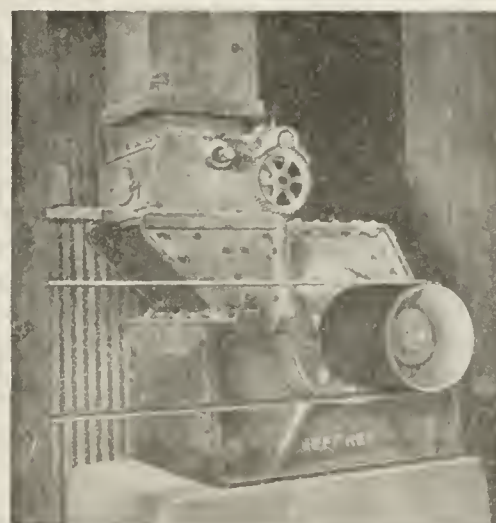
Type A Pulverizer in brick works grinding brickbats.



The "Baby" Pulverizer for educational and commercial laboratories.



Type A Pulverizer solving the top dressing problem for a road contractor.



Type D Pulverizer reducing limestone for farm soils and roads at State Quarry, Franklin County, Ohio.

Bulletin No. 147-14 gives full information on our complete line of Swing Hammer Pulverizers. Write for copy, as well as our New General Catalog No. 83-14, on Elevating, Conveying, Screening, Crushing, Pulverizing and Power Transmission Machinery.

Jeffrey Mfg. Co., 914 North Fourth Street, Columbus, O.

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Superior Jaw Crushers

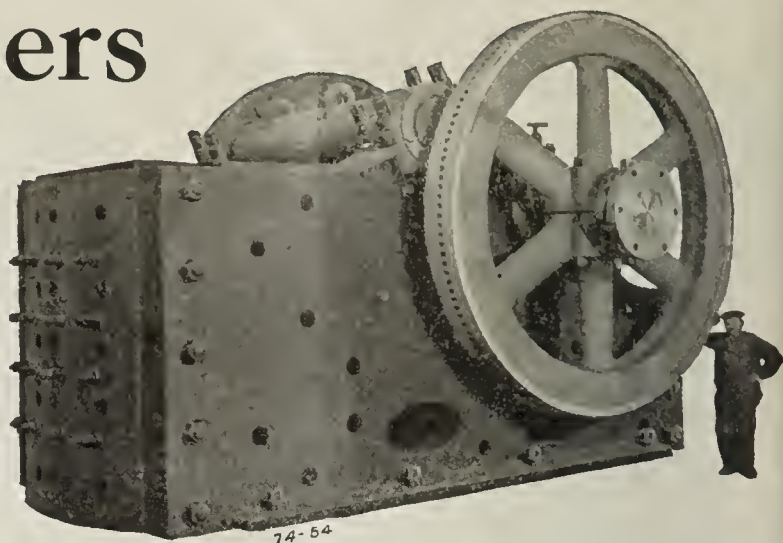
Particularly adapted for Cement Plants—For use in connection with Steam Shovels of largest size. Size of Feed Openings—36"x24"—42"x40"—60"x48"—84"x60". The advantages are—Large Feed Openings—Low Initial Cost—Low Cost of Maintenance—Low Power Consumption—Saving in Dynamite—Saving in Labor over hand loading, and above all ABSOLUTELY RELIABLE. One of our 84"x60" Superior Jaw Crushers crushing hard trap rock has been in operation for nearly five years without the replacement of a *single part*. Described in our Bulletin No. 44—108.

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M 315.2



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For CLINKER, LIMESTONE and COAL
THE LARGEST PRELIMINARY GRINDER BUILT

CAPACITY PER HOUR ON CLINKER

80 TO 120 BBLs.	TO 20 MESH WITH	80 - 90 H. P.
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50 " 60 "	" 80 "	80 - 90 H. P.

UPKEEP APPROX. 1% C. PER BBL.

The Ring-Roll Tube Mill Unit can produce cheaper cement from every standpoint — upkeep capacity, low power and continuous operation than any other. Ask the users, they can prove it to you, and we can.

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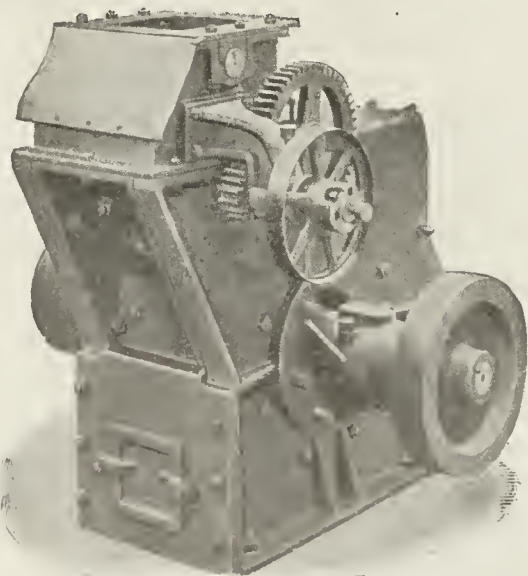
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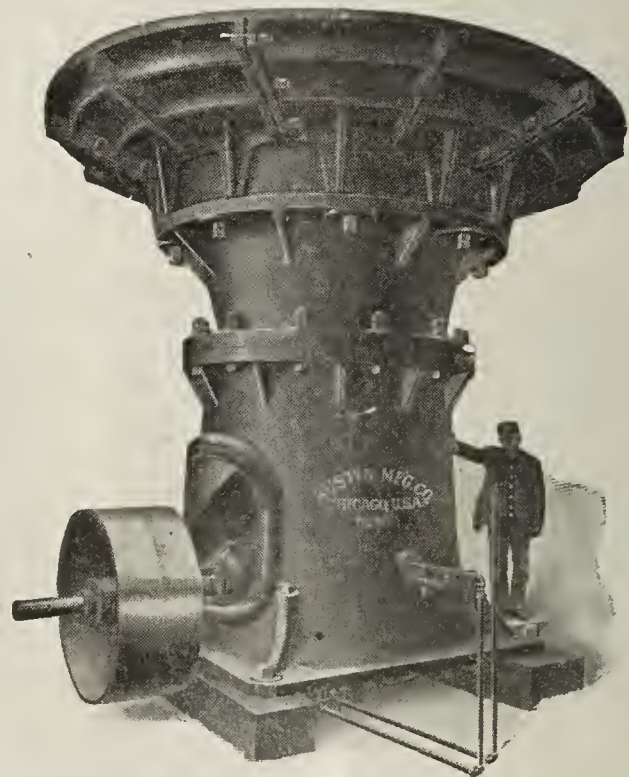
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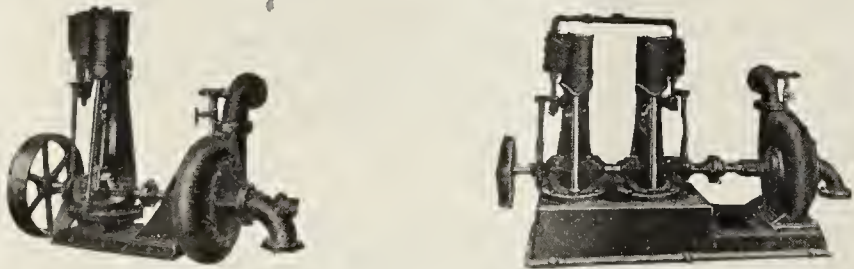
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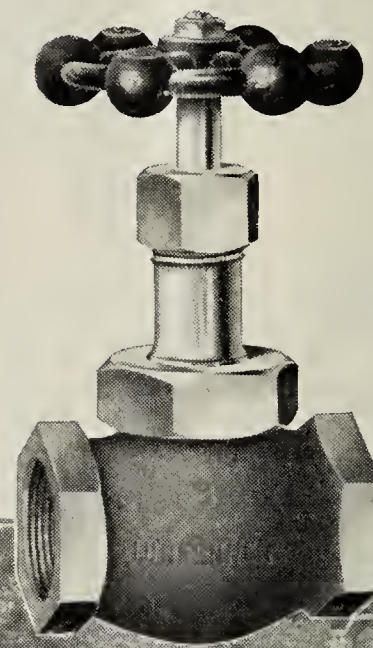
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THEY ARE THE BEST
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\$1,000 Saved by using a Thomas Electric Hoist

AFTER THE FIRST YEAR'S
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ALONE.

Here-
tofore we
used steam pow-
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expenses for broken parts,
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INDIANAPOLIS IND. Feb. 9, 1914

Thomas Elevator Co.,

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We have had no repairs whatever on our electric hoist and have used less than \$2.00 worth of oil.

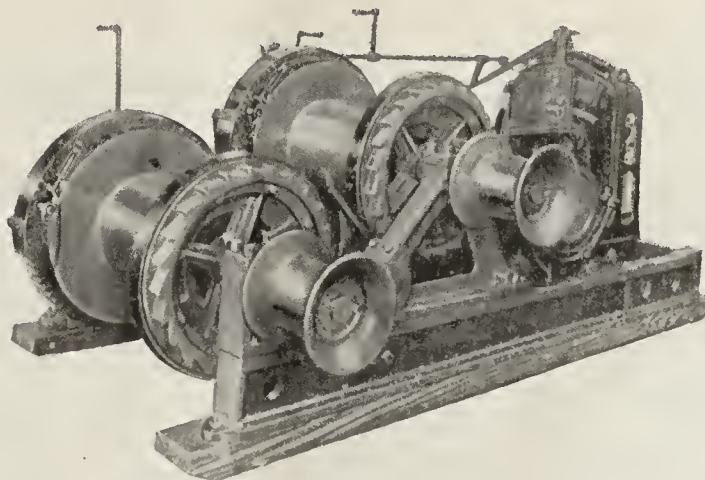
You may take the liberty to refer anyone to us.

Yours very truly

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Per *Stewart W. Maxwell* Mgr.

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built to meet the require-
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economical operation and
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for all classes of work.



Before buying a hoist get our
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JOIN THE ARMY OF SATISFIED USERS OF ELECTRIC FURNACE STEEL CASTINGS

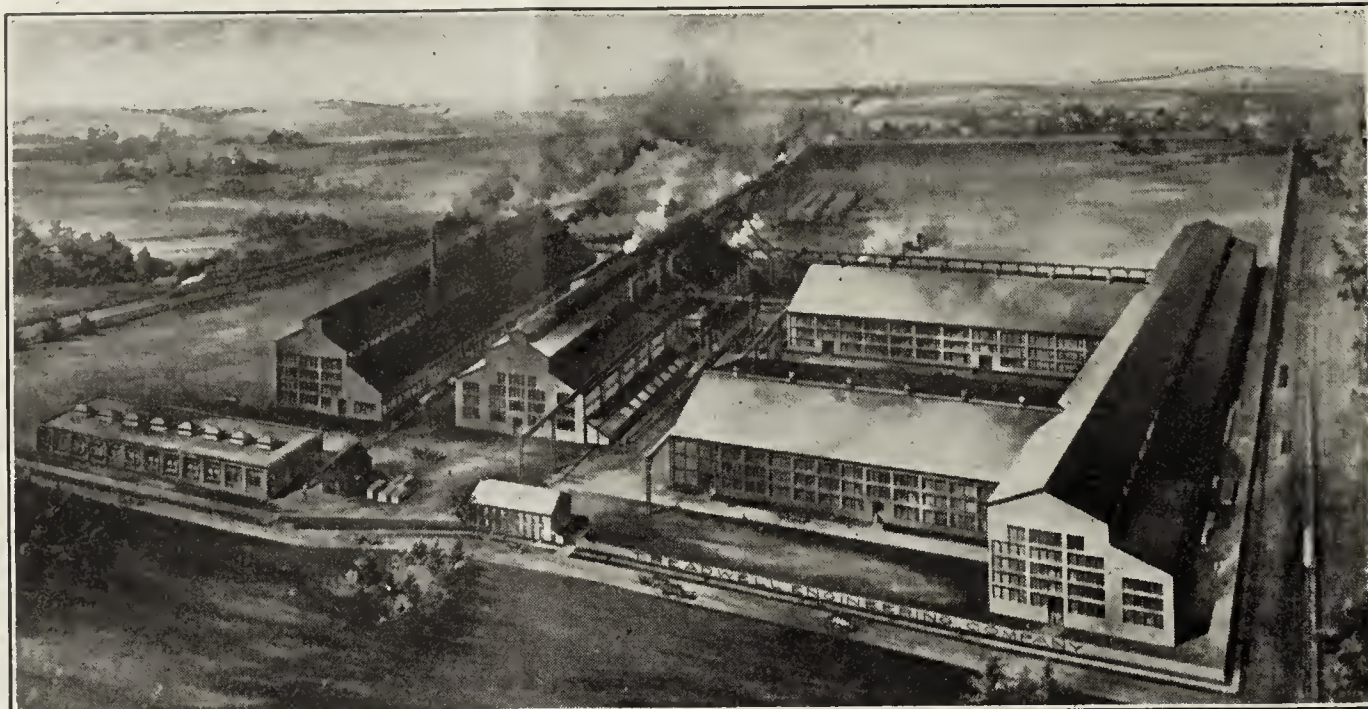
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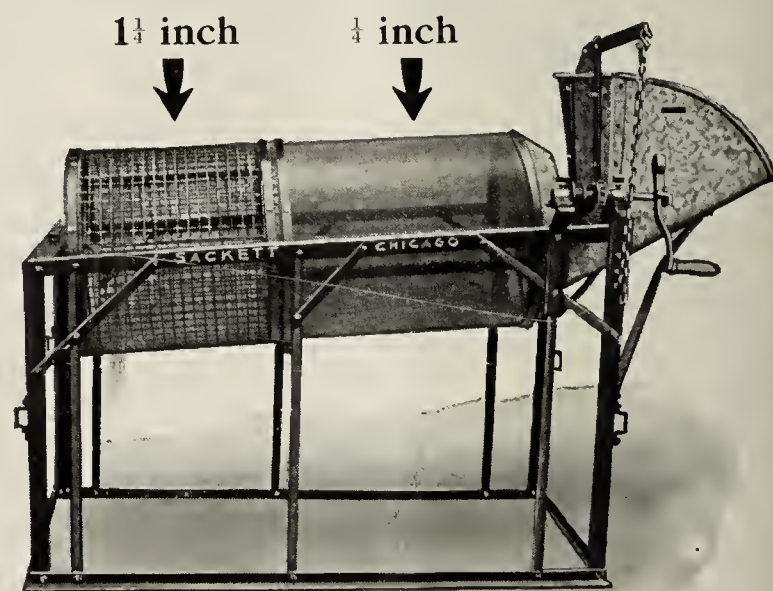
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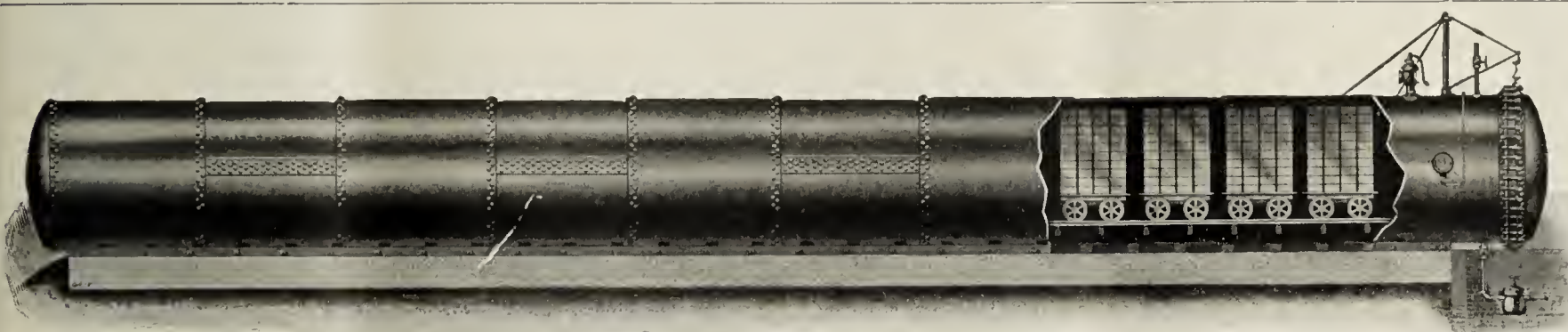
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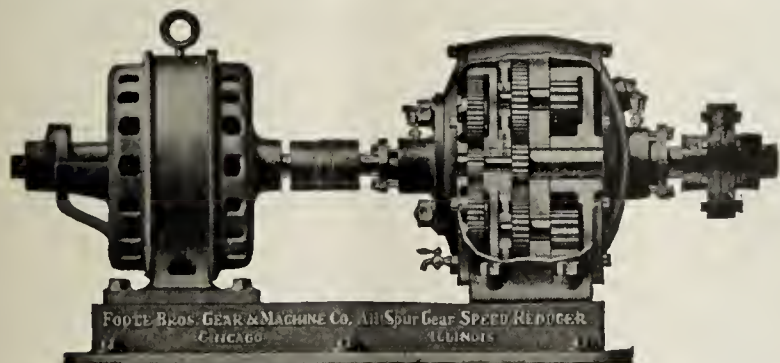
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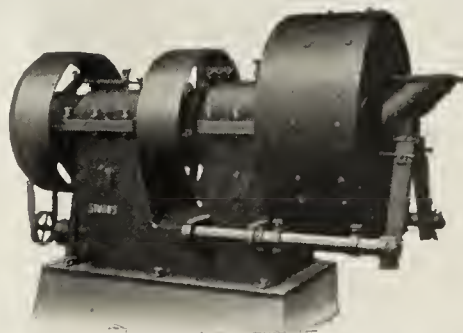
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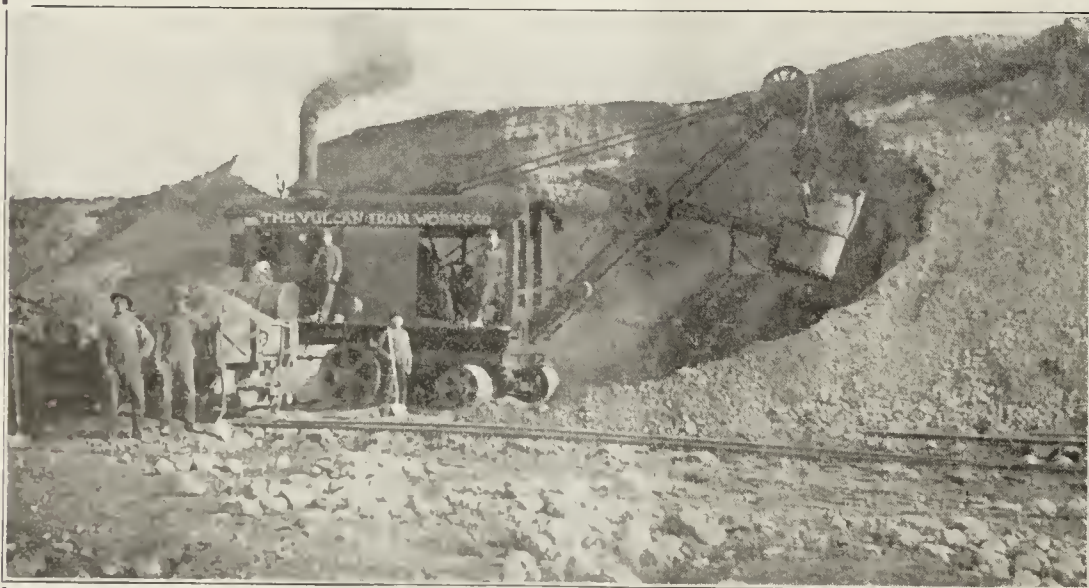
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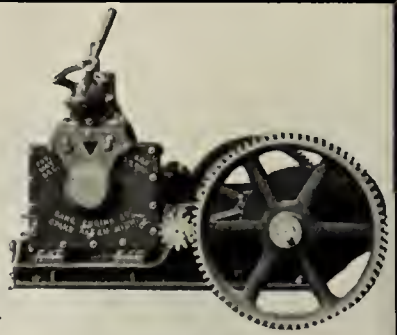


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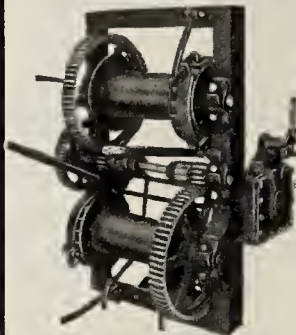
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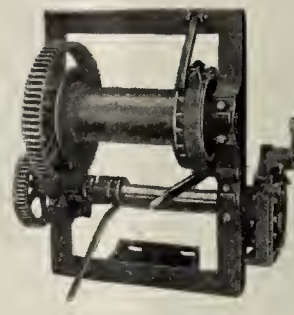
Write for Catalog and Prices



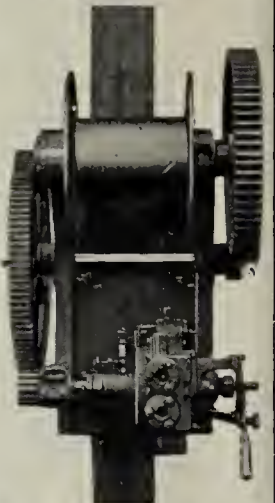
Swinging Engine



Double Drum Motor Crab



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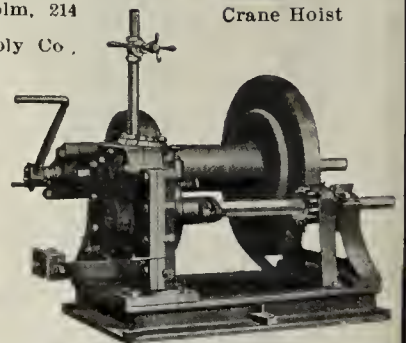
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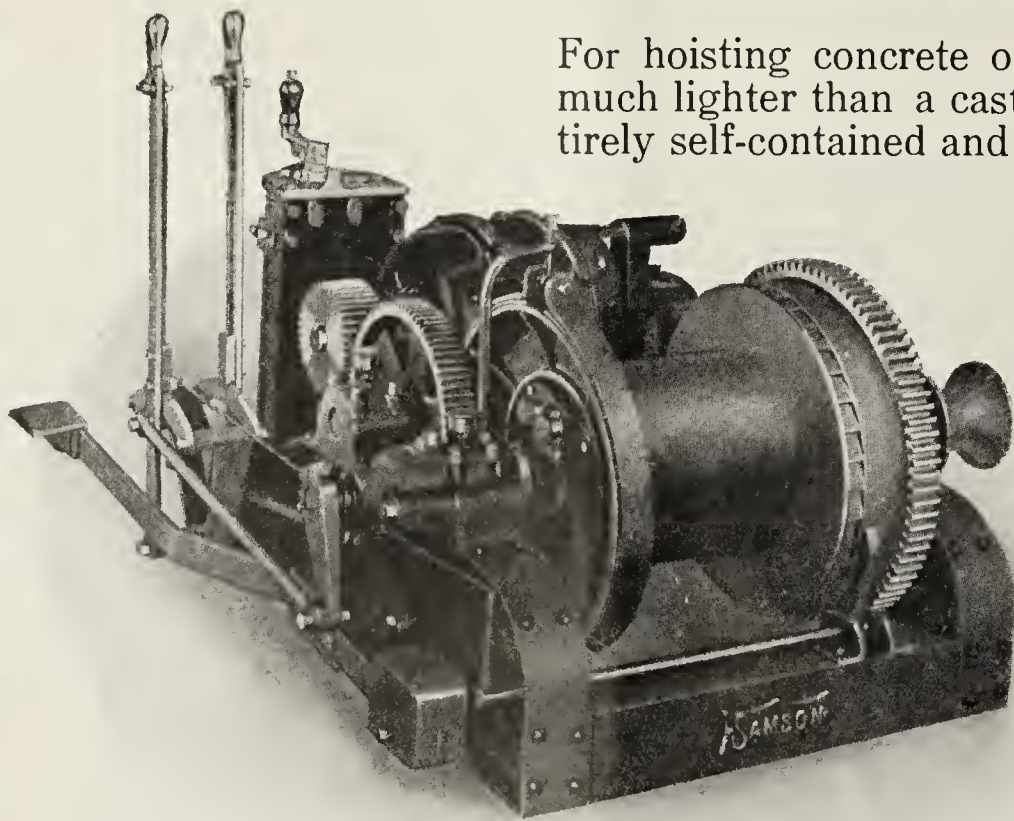
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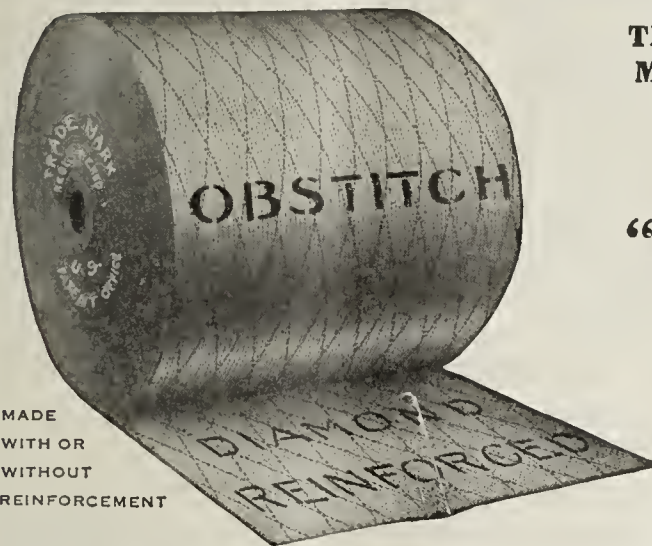
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Adapted for all general requirements such as conveying gravel, cement, clinkers, crushed stone, grain, clay, wood-pulp, salt, tailings, etc. It is far above the so-called standard belt, and one that has given general satisfaction under more than ordinary conditions.

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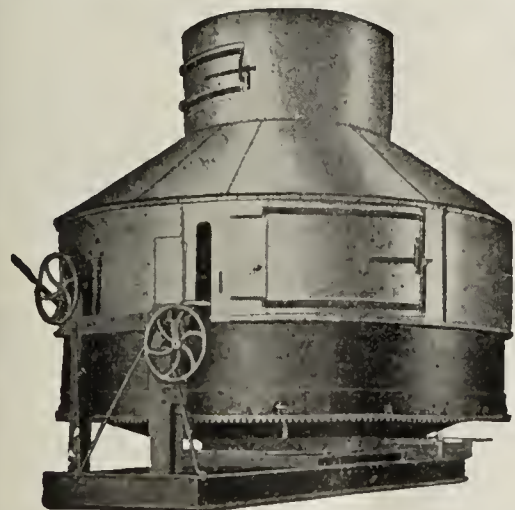
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RESULTS:—Increased Efficiency—Saving in Operating Cost.

We manufacture all kinds of wearing parts subjected to abrasion.

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Operation and Maintenance

With a Negley Excavator

**One
Machine
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**Dumps
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THE DISCHARGE OF MATERIAL IS CONTROLLABLE

FAST OR SLOW AT WILL

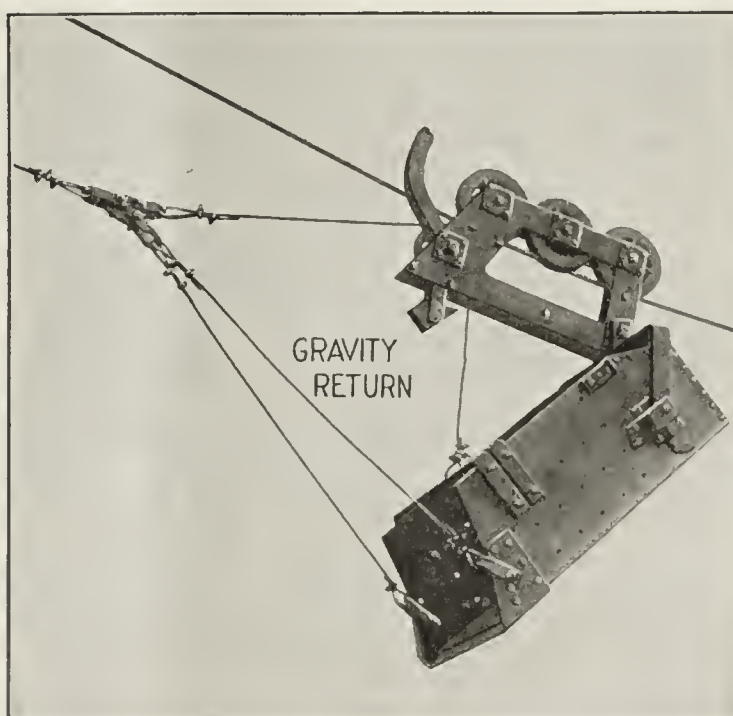
SMALL CLEARANCE GIVES INCREASED STORAGE

Investigation will satisfy
our claims to

EFFICIENCY and ECONOMY

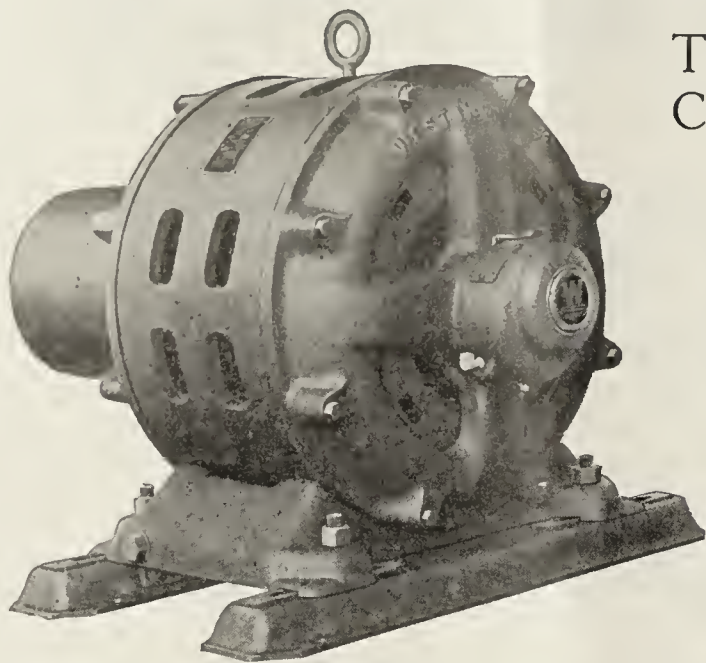
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CHICAGO, JULY, 1915

PRODUCTION OF PORTLAND CEMENT IN UNITED STATES

The total production of Portland cement in the United States in 1914, according to Ernest F. Burchard, of the United States geological survey, was 88,30,170 barrels, valued at \$81,789,368; the production for 1913 was 92,097,131 barrels, valued at \$92,557,617. The output for 1914 represents a decrease in quantity of 3,866,961 barrels, and a decrease in value of \$10,68,249. The value assigned to the production is computed on the basis of 92.7 cents a barrel, or the average value of the Portland cement shipped in 1914.

The shipments of Portland cement from the mills in the United States in 1914 amounted to 86,437,956 barrels, valued at \$80,118,475, compared with 88,689,377 barrels, valued at \$89,106,975, shipped in 1913. This represents a decrease in quantity of 2,251,421 barrels, and in value of \$8,988,500. The average factory price per barrel in bulk for the whole country in 1914 was 92.7 cents, compared with \$1.005 in 1913, a decrease of 8 cents a barrel. This price is about 11.8 cents higher than the average price in the Lehigh district and is near the average price in New York, Illinois, Iowa, the southeastern states, and the plains states, but falls 2.5 cents below the average price received in Iowa, where Portland cement brought the highest figure during the year.

Among the states there were unimportant changes in rank as cement producers. Pennsylvania and Indiana held first and second places respectively, as for many years, but both of these large cement-producing states suffered an appreciable reduction of output. In 1913 the output of California exceeded that of New York and Illinois, but in 1914 this state dropped from third to fifth place. New Jersey dropped from seventh to ninth place, having been passed by both Michigan and Iowa in 1914.

In the far west, in Washington, conditions were brought into better balance by a considerable curtailment of production and an interest in shipments, although prices fell heavily; in Utah production was largely and shipments slightly increased, and prices

were also increased. The only other states showing increases of prices were New Jersey and Texas.

Of the twelve commercial districts into which the United States is divided, there was an increase in production in five—New York, Michigan-Northeastern Indiana, Kentucky-Southern Indiana, Maryland-West Virginia, Iowa-Missouri, and the Rocky Mountain states—and an increase in shipments in seven—New York, Ohio-Western Pennsylvania, Michigan-Northeastern Indiana, Kentucky-Southern Indiana, Maryland-Virginia-West Virginia, Iowa-Missouri, and the Rocky Mountain states. There were decreases in production in seven districts—Lehigh, Ohio-Western Pennsylvania, Kentucky-Southern Indiana, Illinois-Northwestern Indiana, Tennessee-Alabama-Georgia, Great Plains, and Pacific coast. The largest production was reported from New York, but the increase in shipments in that district was only half as great. The district that showed the heaviest percentages of decrease in both production and shipments were the Tennessee-Alabama-Georgia district and the Pacific coast.

CEMENT TILE MANUFACTURERS

From reports which have come to the office of the American Concrete Pipe Association, it would seem that competing interests are watching the cement tile manufacturers as never before. Several letters have come to this office from various parts of the country asking for data with which the campaign against cement tile could be successfully combated.

Down in Indianapolis on May 19, a meeting of tile manufacturers was held, the avowed purpose of which was to take measures to meet the competition being made by cement tile manufacturers. It urged the tile makers to follow up all possible failures of cement tile, getting data and photographs, and placing these before the farmers. It also urged them to get out advertising matter showing the farmers the so-called fallacy of using cement tile.

Under these circumstances this is surely a time for the cement tile manufacturer to be up and doing. He should get as many testimonials as possible from men right in his own locality who have used cement tile and who have found it satisfactory. He should take every possible means to show the farmers that cement tile is really doing the work; but above all, he should take infinite pains that his product shall be the very best which can be made.

Right now, when the other fellows are out with magnifying glasses and fine tooth combs, trying to find failures of cement tile, it is up to every manufacturer of this product to see to it that they do not find what they are after.

See that your materials are clean and well graded. Put in plenty of cement. Cure them right. Do not hurry them out onto the job too soon.

If you are not thoroughly informed on the manufacture of cement tile, send 50 cents to this office and we will send you a copy of the Specifications of the American Society for Testing Materials and a copy of the Recommended Practice of the American Concrete Institute. Get these and study them. Conform your practice to them just as nearly as possible. The other fellows are watching you and you cannot be too careful.

E. S. HANSON,

Secretary, American Concrete Pipe Association.

CEMENT MANUFACTURE IN PERU

Peru is making its own Portland cement, according to reports. Heretofore it has been dependent on the United States, Belgium and England.

THE SAND & GRAVEL PLANT ON PROFIT ISLAND, LA.

A remarkably efficient sand and gravel handling plant has recently been put in operation by Mr. J. W. Thompson near New Orleans.

The gravel and sand, obtained from Profit Island, about twenty miles distant, by four Morris suction dredges, is brought to the plant in barges and is there unloaded by means of a floating stiff-leg derrick operating a 3-yard clam-shell bucket. The bucket dumps into a large hopper, also mounted on the derrick barge, from which the material is loaded into an 11-yard car, and is then drawn up an incline track laid upon the sloping levee.

This stiff-leg derrick has a 62-foot boom and a 16-foot bullwheel. The bucket is operated at a 47-foot working radius. This bucket was furnished by the Andresen-Evans Company and it weighs approximately 7,500 pounds. All the wire rope furnished on the derrick and bucket was Leschen's Patent Flattened Strand Hercules; about 1,300 feet being required in $\frac{3}{4}$ -, $\frac{7}{8}$ - and 1-inch diameters.

At the top of this incline track, the car dumps into

dling of the mixed sand and gravel just as it is obtained from the river, this portion of the bin being loaded from the second conveyor mentioned previously. The remaining three-eighths of the bin is divided into number of compartments, and is devoted to the various sizes of washed and screened material.

The whole plant is designed for a normal working capacity of 2,000 yards, or approximately sixty cars per day.

This plant was designed by Brenneke & Fay of St. Louis, and we are indebted to them for our description of the plant.

A GRAVEL DREDGE AND WASHING PLANT

Nickum & Kelly of Portland, Oregon, operate a large sand and gravel dredge on the Willamette River and in this way produce a great deal of the sand and gravel used for concrete purposes in Portland. The dredge excavates material at the rate of about 100 yards per hour and delivers a screened product over a belt conveyor to barges at the side.

The method of excavating is by means of a digging ladder of rather large dimensions. Its length between



View of Profit Island Sand and Gravel Company's Storage, Loading Bins and Washer.

a second hopper, which loads the sand and gravel on to a 30-inch inclined belt conveyor leading to the bin beyond. As the long dimension of the bin is at right angles to this conveyor, it is necessary to transfer the material to a second belt running horizontally along the long axis of the bin. This conveyor is equipped with an automatically propelled tripper, which travels back and forth and loads the material uniformly into the bin.

When desired the sand and gravel can be transferred, by means of the tripper and chute, from this second conveyor to a third one, on which it is elevated to a washing table. Here the material is thoroughly mixed with water, and is then carried by means of sluices over various sized screens, which separate it into the different common commercial sizes, the excess sand and dirt being carried back with the washing water into the river.

From the bin the material is loaded directly into cars through gates in the floor, the bin being wide enough throughout its full length to accommodate two tracks.

The storage and loading bin is 28x130 feet in plan with walls 15 feet high, giving a total storage capacity of about 2,000 yards. About five-eighths of the total length of the bin is devoted to the storage and han-

centers of end sprockets is 80 feet and the buckets which are carried on an endless double strand chain. The steel bar links have a capacity of five cubic feet each. The rigid steel frame, which carries the buckets, is raised and lowered by a steam hoist and it may be lowered sufficiently to dig from 35 feet below the water level.

The excavating buckets discharge directly into a revolving screen which washes and sizes the gravel, making but one separation. All material passing through this screen is delivered to the belt conveyor leading to the barges. The over-size from the screen is passed below to a 48-inch Symons Disc Crusher manufactured by Chalmers & Williams, 1457 Arno street, Chicago Heights, Ill., and under the original arrangement, the crusher also discharged direct to the off-bearing belt conveyor.

This arrangement, however, proved to be unsatisfactory as many of the stones passed through the crusher without being crushed and when mixed with the gravel rendered it unsuitable for concrete purposes. On account of being excavated from the river the gravel contained many flat stones three or four inches in diameter and but half an inch thick and it was these stones that were not affected by the crusher.

It was, therefore, decided to return all materi-

from the crusher to the screen and to allow nothing but screened gravel to be delivered to the barges. In this way, the flat rocks in passing between the crusher and the screen would accumulate in sufficient numbers to pass through the crusher discs two at a time and thus be crushed.

This solution of the difficulty proved to be most difficult of execution as the dredge was already crowded with machinery and it seemed at first impossible to install machinery for handling material from the crusher to the screen. After measuring the clearances, however, very carefully and trying several different methods, it was found possible to install two belt conveyors, operating at a vertical and horizontal angle with each other, which would handle the material without interference. The drive was also a difficult part of this small conveying system. The problem was met, however, by means of gears, sprockets, chain and a universal coupling.

only of the concrete bridge business and that no concrete bridge whatever can be erected without infringing some claim of the Luten patents.

Were this true, it would only prove that those improvements that have made the concrete bridge a commercial success in spite of strenuous opposition from steel bridge interests, must have been first disclosed to the public in the Luten patents, and that, therefore, Luten is entitled to his royalties as his reward.

All Luten patents are open on an equal basis to all bidders except those under court injunction.

Suits for infringement under the Luten patents are never filed except under the most extreme provocation. Before a suit will be filed under these patents there must have been something more than mere infringement.

Designing engineers are never prosecuted under the Luten patents except when they oppose authorized Luten designs for their own infringing plans.



View of Profit Island Sand and Gravel Company's Unloading Derrick and Incline.

Since adopting this plan and installing the two conveyors, the flat rocks have been eliminated from the gravel and the machinery has operated most satisfactorily.

LUTEN DESIGN CONCRETE ARCH

Daniel B. Luten, consulting engineer of Indianapolis, is, inventor of many patents on concrete bridges, is one of the most experienced and successful concrete bridge designers in the country. The vast amount of engineering work that he has done in the past sixteen years is well illustrated in a new catalog which contains photographs of many hundred concrete bridges built under his supervision. It is a striking example of the popularity of the concrete arch. He has also just issued a booklet entitled "Do Patents Prevent Progress in Concrete Bridge Design?" and we urge our readers to send for a copy, as it contains useful and interesting information concerning the Luten design concrete bridge.

United States patents to the number of thirty-nine, and containing four hundred and ten claims, have been granted to Mr. Luten for his own improvements in concrete bridges. Numerous suits for infringement have been filed under these patents and twenty-two decrees of injunction have already been issued. No suit based on a Luten patent has ever been dismissed, nor has any claim ever been found invalid.

State Engineer Gearhart of Kansas, and State Highway Engineer MacDonald of Iowa, have charged that the Luten patents constitute a complete monop-

To avoid suit under the Luten patents, either do not infringe or if you will infringe be decent about it.

Those infringers who "knock" Luten designs and who violate the codes of ethics of engineering societies will be considered especially objectionable infringers.

The Luten patents constitute the strongest support for a code of ethics in concrete bridge design.

Some of the benefits resulting to the concrete bridge industry because of the Luten patents are shown in the illustrations and testimonials in his latest booklet. Without patent protection, how could any engineer afford to give the time to promote the industry as indicated by the articles on concrete bridges contributed to engineering journals by Daniel B. Luten? Approximately six thousand bridges of Luten design have been erected under the Luten patents, and the authorized business done under these patents has grown from \$400 in 1900 to \$2,000,000 in 1913.

SYMONS DISC CRUSHERS

The White Oak Crushed Stone Company, Plainville, Conn., are installing a 36-inch Symons Disc Crusher, manufactured by Chalmers & Williams, Inc., Chicago Heights, Ill.

The Dayton Gravel & Sand Co., Dayton, Ohio, have a 24-inch Symons Disc Crusher in their plant which is giving splendid satisfaction.

Nickum & Kelly, sand and gravel producers of Portland, Oregon, operate a 48-inch Symons Disc Crusher in their plant on the Willamette River.

THE McDONOUGH LIMESTONE QUARRY

The McDonough limestone quarry, recently developed by the McDonough Ore & Mining Co., is situated at Gate City, Alabama, just outside of the north boundary of Birmingham. The limestone formation at this point covers about 100 acres, and ranges from 200 to 350 feet in thickness. The main quarry at present is at the top of the hill. The floor is about three acres in extent, and the walls about 90 feet in height. The situation is favorable to a low cost of production, as there is almost no overburden to be removed, the drainage is natural and the railroad grades are in favor of the load from the quarry to the tippie. An interesting feature is the situation of the quarry with relation to the railroads. At Gate City is one of the few gaps through which the transportation lines enter Bir-

The tippie is approached by a trestle about 200 feet long, on which are laid three tracks, 6 feet 6 inches center to center. One outer track leads to a No. 10 Austin gyratory crusher, the middle track is for the return of the empty cars while the third leads to the rip-rap bin. The grades on the incoming tracks are 1.5 per cent in favor of the loads. The cars are dumped singly in a balanced tippie. The crusher is driven by a 150-horsepower Allis-Chalmers motor.

After passing through the crusher the rock passes over two 22-foot by 4-inch shaking screens, driven by a 10-horsepower motor. The slope of these screens is $2\frac{1}{2}$ inches per foot. The fines are passed through Williams pulverizers, have a capacity of 150 tons per day and driven by a 75-horsepower Westinghouse motor.



View of Limestone Plant of the McDonough Ore and Mining Co., Gate City, Ala., Equipped with Austin Gyratory Crushers and Williams Pulverizers. Two 75 H. P. Westinghouse Motors Operate the Pulverizer and the Air Compressor.

mingham from the north. It is, therefore, possible to deliver material from the bins direct to the tracks of the Louisville & Nashville, Alabama Great Southern, Central of Georgia, Southern Seaboard and Birmingham Railway, Light & Power companies' tracks, and also to the county highway. With these seven outlets for the product, the transportation facilities are almost ideal.

The limestone here quarried is from the Chickamauga (Pelham) limestone formation. This was deposited on the eroded surface of the Knox dolomite, and is consequently of varying thickness, ranging from 200 to about 350 feet at this point.

Air is supplied to the drills by a 14x9-inch, 12-inch air compressor, driven by a Westinghouse 75-horsepower motor. This has a displacement of 446 cubic feet of free air per minute at 210 R. P. M.

The rock is loaded by hand into three-ton tram cars. The tracks to the face are laid out in a fan shape, making it possible to load several cars at once. They are then made up in trains of from 7 to 10 cars and hauled by a 12-ton Vulcan "dinkey" locomotive over a 42-inch gauge track to the tippie.

The smaller products are conveyed by belts, driven by a 25-horsepower motor, to the storage bins. From these bins it is loaded into a standard-gauge 10-ton car and transported to bins over the tracks of the various railroads mentioned.

As considerable time is consumed in lowering and hauling this car, it is to be replaced by a 30-inch conveyor belt fitted with trippers over the bins. This belt will be 615 feet long center to center of pulleys.

The limestone is of a light gray or pale blue color. The texture of the strata differs, granular and amorphous layers of varying thickness alternating, the thickness ranging from two feet to a few inches.

The quarry face worked is about 200 feet long and 20 feet high. The bench is drilled with holes located about 10 feet back from the face and from 8 to 10 feet apart. For this work, two $3\frac{1}{2}$ -inch air drills are used, the steel being $1\frac{1}{4}$ -inch hexagonal. These holes are drilled from 20 to 30 feet in depth. A round consisting of from 15 to 20 holes, and is shot at one time with electric exploders. The powder used is No. 2L Aetna, $1\frac{1}{4}$ inches diameter and 40 per cent nitroglycerine.

Five products are made at the plant: Jetty stone, from 700 to 3,000 pounds; riprap, from 10 to 100 pounds; fluxing stone, 2 inches down, free from dust; concrete stone, 1¼ inches down, free from dust, and agricultural stone or dust.

The company is advertising the agricultural stone extensively, claiming that it not only neutralizes the acidity of soil, but that it also supplies the element calcium to the growing plant.

TILE DRAINAGE*

By W. J. Schlick

If an historian should make a study of underdrainage, the present decade would undoubtedly stand out pre-eminently as a period of development, a period during which methods based on some "rule of thumb" have given way to other methods that are the result of careful study and investigation and which are based

With the use of tile of large sizes has come the practice of placing these outlet mains at greater depths. Some distant portion of the district is low and requires that the main be placed at a great depth in order to furnish a suitable outlet. Or it is found that it will be cheaper to lay this large main at a greater depth through a ridge than to construct the longer but shallower line around the low ground.

The writer has knowledge of drains laid at depths as great as 20 feet, while large tile, 18 inches in diameter and larger, laid at depths of 7 to 15 feet, are not uncommon.

As these larger and deeper drains were being constructed, the discovery was made that many of the tile previously laid were cracked, and that in some cases they had collapsed. As the depths were increased, the tile were called upon to support larger loads, loads which in some cases were too great. The taxpayers,



Perhaps the Largest Crusher Plant in Iowa. The Le Grand Quarry Company Crusher Plant, Le Grand, Marshall County, Iowa.

upon accurate scientific principles. The rapid advance in the value of farm lands has not only made possible but has demanded more careful drainage work in larger and more efficient systems.

A few years ago one tile system drained a few acres or a part of one section, now one system will serve several sections. This increase in the size of the systems has required the use of tile of larger size. When a large underdrainage system was planned a few years ago an open ditch was constructed to furnish an outlet. The increase in the value of farm lands and farm crops have now made it economically advisable to substitute the large tile outlet for this open ditch. It has not been many years since the engineer who planned a drainage system in which 30-inch tile were to be used was thought to be visionary. Now, almost every engineering paper contains notices that this or that drainage district is ready to receive bids for the construction of drainage systems in which 34-inch, 36-inch and even 44-inch tile are to be used.

*Paper read at the recent convention of the American Concrete Pipe Association by W. J. Schlick, drainage engineer for the Iowa Experiment Station at Ames, Iowa.

tile manufacturers, contractors and the engineers then demanded an answer to two questions: How much load will a tile of a certain size and material carry? How much load is a tile required to support when laid at a certain depth in a certain soil? The old methods of judging tile by inspection and testing their strength by means of the "long handled 4-pound hammer" were no longer satisfactory. Methods for determining the supporting strength of tile have been determined and have recently been incorporated in a set of standard specifications by the American Society for Testing Materials. The Iowa Engineering Experiment Station has published a bulletin giving the results of careful investigation of the loads which the trench filling places on the tile, with an easy method of determining this load for each particular case.

As these two questions were answered, a third problem was presented for solution; that of manufacturing a tile of the required strength. The many cracked tile in the ground were evidence that the old methods were not producing tile which would meet the new requirements. As is a trait of our American people, the manufacturers and engineers set about finding a tile

which would meet their demands. The concrete tile interests produced a tile with a greater thickness of wall. When this was found to be lacking, they turned to this great adversary of all structural materials, reinforced concrete."

Mr. Schlick discussed in detail the results of a number of tests which have been made on reinforced concrete pipe from time to time.

ROUND CONCRETE BUILDINGS SAVE MONEY FOR THE FARMER

Concrete has proved to be the farmer's best building material. The first structure of concrete on the progressive farm is generally a silo. Its safety from fire, and its permanence, frequently lead to other improvements of concrete, such as stock and feed tanks, feeding floors and stable floors, and a hundred other improvements which make stable work easier and reduce the danger of loss from fire.

While the contractor is building a monolithic concrete silo, the owner should consider whether there are not other buildings needed which might be made with silo forms. If the contractor builds not only a silo, but a milk house, a coal bin, a grain bin or a hog wal-



low, with the same forms, he will be able to make a much lower price than if he builds only a silo; because his equipment is all on the ground. He can just as well build a milk house or a stock tank of circular form, and the farmer may obtain these improvements at minimum cost.

There are many examples of such construction.

On this page is shown a milk house on the farm of O. G. Sherburne, near Coldwater, Mich. This was built at the same time as two big monolithic concrete silos. Both milk house and the silos are 14 feet in diameter, and have concrete roofs. The former is 10 feet high, and the latter are 40 feet in height. The milk house has doors, windows and circular cooling tank in the center, a floor surrounding the tank, and a platform at the level of a wagon bed; while the silos have chutes and feed rooms. These differences are mere details.

The walls, which generally require the most lumber for forms, are built with a single set of silo forms in the most economical way. The same problems came up in the construction of each, and while the contractor was on the farm with his equipment he was able to do this additional work at a much lower price than would ever have been possible if each structure had been built alone.

There shortly will be installed a trolley system between the cow stable and the milk house which will permit milk cans to be brought through the door at the left and dropped into the cooling tank with the

least possible labor. In order to make the later handling from tank to wagon as easy as possible, a platform, about 6 feet long, was built up on the south side of the circular tank inside, and at a height convenient for loading into wagons through the door shown in the center of the picture. A small platform outside supported on brackets, may be seen. In the center of the roof is a tile for ventilation.

KEEPING REINFORCEMENT IN POSITION

The holding of reinforcing bars in proper position while concrete is being placed is a matter which merits the utmost attention. The labors of the best designer and detailer can be set at naught by the carelessness of those in charge of the construction of reinforced concrete structures, while placing steel and concrete, says The Improvement Bulletin.

A designer spends many days designing and detailing a complicated structure, the strength of which can be greatly impaired by comparatively slight displacement of the reinforcement at critical sections. Much time is spent in designing and detailing the reinforcement for a structure and the all-important matter of getting and keeping the bars in correct position is disposed of by a single note such as the following: "All reinforcement to be bent and placed as shown on plans and to be securely fastened or tied to prevent displacement during pouring of concrete and to insure proper position of reinforcement in the finished structure." It is left to the discretion of the construction foreman to devise a means of keeping the bars in position and as a result the strength of the structure may depend on whether the foreman thoroughly understands his business or not.

This is neither good practice nor economy. The method and means of supporting reinforced bars should be clearly indicated on the plans, since these are as important details as the location of bends, bars and stirrups. Where bars are bent up into the tops of slabs and beams they are best supported by cross bars resting on concrete blocks of a height to insure the exact location of bars. Bars in the bottom of slabs can be kept at the proper height by small Z shaped clips and spacing bars to which the main bars are wired.

It is just as important to show the supporting bars, supporting blocks and clips, and the spacing bars as it is to show the main reinforcement in detail. Before the structure can be built it is necessary for some one to devise a means for keeping bars in position during construction, and as a general rule, a good designer is more capable of handling these details to good advantage than anyone else. If it is left to the contractor the owners pay dearly for this "designing service" rendered by the contractor if he is wide awake; and if he is not, he pays the bill. It can be seen at once that this is neither fair nor economical, and is very likely to lead to "wild" and "unbalanced" bids.

If a contractor is to bid intelligently and if all contractors are to enter their bids on the same basis, it is imperative that these details be shown on the plans when the work is at all complicated or important. The double purpose of keeping the bars in place and having more balanced and uniform bids is fulfilled at once by including these supporting details in the detail plan and the practice should be encouraged and should be more in evidence than in the past.

WHY YOU SHOULD BUILD A CONCRETE SILO

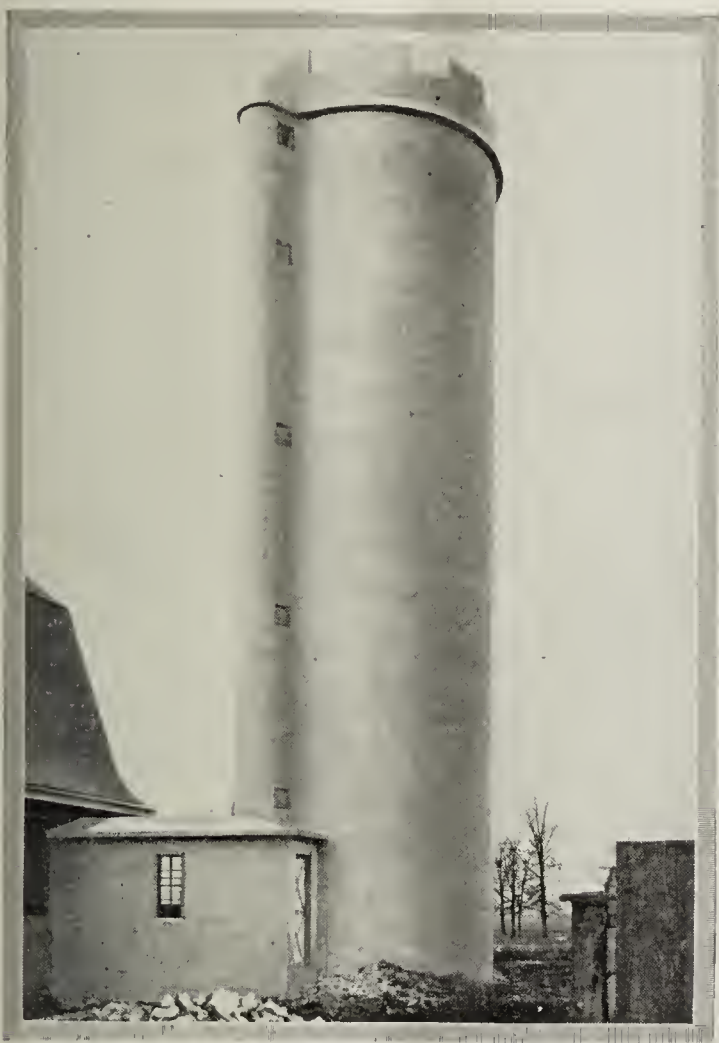
At one time the silo was used only to furnish succulent feed in winter. Now it supplements the

pasture at both ends of the growing season and in any cases takes its place throughout the year.

Even in the most fertile parts of Illinois, Indiana, and Iowa, pastures occasionally burn up. A few months drought means lack of green feed unless the farmer can fall back on silage. Without a succulent feed the milk yield drops to an unprofitable figure.

The permanent silo is crop insurance. It makes profits greater by putting to use all of the corn crop in the most efficient way possible.

Silos are not new in farming. Hundreds of years before Christ the Egyptians put grain and other crops in strong covered jars. Julius Caesar made huge clay-



Concrete Silo Built for the Board of Supervisors of Kane County, Ill., with Polk Forms. Wm. Warford, Geneva, Ill., Contractor.

ned pits along his military roads to hold green forage which served for the return march.

In Africa the natives store corn in a structure much like a silo, but built of interwoven reeds plastered inside and out with clay, standing on stilts to keep away from the moist ground, and roofed with thatch. These are built from three to six feet in diameter and from six to nine feet high.

The Board of Supervisors of Kane County, Ill., were forced to rebuild a barn and silo which had been destroyed by fire and asked for bids on a silo of unusually large proportions. It was to be 16x60 feet in size, with a chute 28x30 inches and a feed room 8x15 feet, all of concrete. In addition there was to be a steel ladder going down the outside.

Wm. Warford of Geneva was awarded the contract for \$1100. This silo is as good an example of concrete construction as the country affords and was built with Polk forms. The silo walls are 6 inches thick and the chute walls 4 inches. The foundation goes down 4 feet and as poor foundation conditions were found, a 22-foot reinforced concrete slab, 7 inches thick, was built below the foundation level. On this was placed a concrete foundation ring, 3 feet wide and 16 inches thick, on which the walls were built up.

Wall reinforcement for high silos is very important. In this case, the horizontal reinforcement is continuous

except for every fourth rod which is interrupted by the door opening. Nearly two tons of steel were required and 106 barrels of Universal Portland cement.

When the silo door is continuous it is absolutely necessary that the ladder system across the opening be firmly attached to the horizontal reinforcing steel. The ladder and its connection to the steel must be as strong as the steel itself, making practically a continuous ring. If this is neglected, failure may result.

The roof is a flat slab of concrete, reinforced with wire mesh. The battlements extend 4 feet above the roof and are added only as an ornament.

The feed room has 6-inch walls and a 4-inch roof, pitched from a ridge. The track and feed carrier extend from the barn into the feed room, immediately under the chute. Tight doors prevent silage odors from entering the barn.

Such a silo involves a heavy expenditure but not out of proportion to the cost per ton of silage of smaller silos. This has a capacity of between 450 and 500 tons, making the cost per ton from \$2.20 to \$2.40. No building except the silo will house so much feed for so little cost.

It would pay, therefore, to use silage as much as is possible and to supplement it with only what grain and hay are necessary. This will not only cut down the investment in permanent buildings but reduce the labor of feeding, as there is nothing easier to feed than silage if the barn is equipped with carriers.

Bankers should be more than willing to make heavy loans for concrete silo building, as there is no better security or form of investment that will do as much ultimate good to the farmer and therefore to the community. The silo cannot depreciate in value by age and will increase profits every year.

"CONCRETE FOR PERMANENCE"

Concrete has revolutioned the art of building and every day more advocates of its use enter the field and thereby spread its fame to all parts of the earth. As with all industries enjoying a rapid growth, more or less poor concrete has been put in structures by unscrupulous men in an effort to get "rich quick." Such concrete, usually containing very little cement, is not permanent and does the industry an injury, the effects of which cannot always be measured. What we need is a campaign for better concrete, that is concrete in which sufficient cement is used to properly fill up the voids in the aggregate, then many of the troubles often confronting us (due to poor concrete) will disappear.

Many of the men in the concrete field have taken up a slogan to promote the concrete industry, which is an excellent one, viz., "Concrete for Permanence." In this slogan the word good is implied as a prefix and it would have perhaps been a good idea to actually use the word in that connection until the industry had reached such a stage that when the word concrete was mentioned the idea at once conferred, would be "good concrete."

"Good Concrete for Permanence" should be the watchword of every engineer, contractor, superintendent, foreman, and so on down to the wheelers of aggregate. The man in charge should make it his duty to impress upon his men the necessity of care and cooperation in producing good concrete and the benefits will soon become apparent.

A slogan generally is the means of cementing together the various elements in the field, and the end is attained sooner than if each unit struggles along in its own way toward the goal. Therefore, let us all unite for the benefit of the whole concrete business and use the slogan wherever and whenever consistent.

LOCOMOTIVE SHOP BUILDING OF CONCRETE BLOCK WALLS

The Elgin, Joliet & Eastern Ry. Co., has built at Joliet, Ill., a locomotive shop building which is probably the finest structure of its kind in the world and represents an expenditure of upwards of \$600,000 for building and equipment. It is not in an exposed location yet a very successful attempt has been made to produce a shop which should combine not only maximum utility and convenience for locomotive repairs but which should be architecturally pleasing and of a high degree of permanence. It is the first of a probable group of railway buildings which will express a harmony of design and material which is seldom found in railway structures.

The building is a huge rectangle 150 feet by 575 feet, with a monitor extending the full length. From the ground to the roof of the monitor is 78 feet. The east half is entirely open and served by heavy cranes while the west half has a balcony accommodating heavy lathes and other metal working machines on the first floor, and store-rooms, lockers and washing facilities for the men on the gallery. A sense of the hugeness of the structure can be obtained by noting

great heights. The large unit size brought about an economy of mason labor and their true dimension made alignment easy. The aggregate used was a 1 2½ : 2½ mixture using ½-inch limestone aggregate and torpedo sand. This coarse aggregate accounts for the rough exterior of the block. This was intentional and adds considerably to the beauty of the wall. There is enough accidental variation in color from block to block to give some life to the large areas and light colored blocks were purposely used for decorative effect at the corners, as may be seen in the illustration showing the front of the building. Approximately 60,000 blocks were required, displacing more than one million common brick.

The pilaster caps as well as copings and lintels are all of smooth surfaced concrete stone made on the ground, in comparatively small units, not greater than 24 inches in any dimension.

The lettered panel in the front wall are composed of concrete veneer blocks each the size of one letter, cast similarly to the trim.

The use of Hydro-Stone for the curtain walls followed its use by the Illinois Steel Co., in their gas engine electric station. The only difference between the



Built of Concrete Blocks. Locomotive Shop Building. Approximately 60,000 Blocks Were Required, Displacing More Than One Million Common Bricks. Blocks are 9x24 Inches and are Laid up in a 12-Inch Hollow Wall.

the height of the man standing in front of the central doorway.

It is not a difficult problem to design a huge structure nor to plan it so as to give efficient service. Permanent materials of construction are standardized, yet to design a structure of this size which shall not show merely a duplication of units or huge unbroken areas of walls and glass, but instead, shall have a definite architectural scheme, perfect balance and quiet dignity and forming a composite whole is a most difficult problem. It has been solved with considerable success and the building is one which will stand as an excellent example of architectural development of industrial building and the harmony resulting from a balance of masses and voids.

A large percentage of the wall area is in glass and the window units are 12x17 feet. A simple molding finishes the coping, giving a most pleasing effect and yet one which was obtained at very little added expense.

The frame work is of steel and the curtain walls are of Hydro-Stone. The blocks are 9x24 inches in size and are laid up in a 12-inch hollow wall. The nature of the bond is such that the wall is self-sustaining for

blocks used in this building and in those of the Illinois Steel Co.'s. structure lies in the coarseness of the aggregate and this feature has added greatly to the beauty of the wall. The block machine was an old type not adapted for casting detail pieces but the late machines permit molding trim up to 24x24x12 inches in size which are sufficiently large for practically every detail.

The shop was designed and the wall material specified by the railroad's own force under A. Montzheim, Chief Engineer, and built by the Newkirk & Power Construction Co., of Joliet, using Hydro-Stone made on the ground with machinery leased from Barron & Harridge of Chicago.

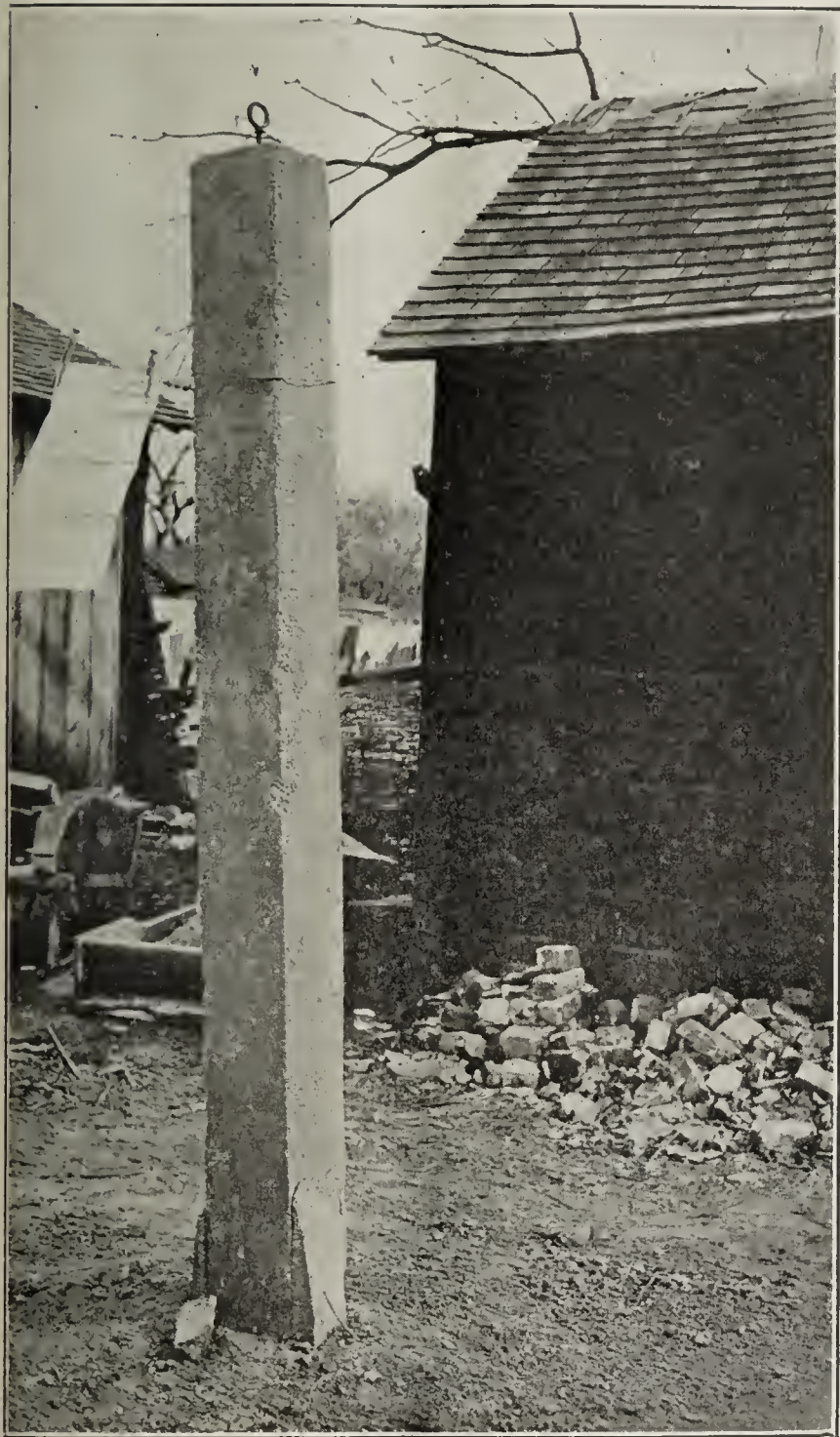
EVERLASTING CLOTHES POSTS

The trend of the times, in the construction of all our door accessories for the home, is to make them durable. They will then give to the property the well kept look which appeals to all when the question of value, neatness or tidiness is considered. The subject of clothes posts usually is given no consideration, but on contrasting the general appearances of many yards one is immediately struck with the idea that a post

such as shown in the illustration would be a positive economy and advantage. Many a good housewife all too often finds that, due to a weak, wobbly post, her clean linen has been blowing all over the back yard until its condition beggars description.

Concrete clothes posts are everlasting. They keep in better alignment than the lighter wood posts. They will not rot or burn down and they are rigid enough to sustain any number of lines.

The post should be about 11 feet long, 8 inches square at the top and 12 inches square at the base, and should be firmly embedded at least 3 feet in the ground. It should be reinforced with $\frac{1}{4}$ inch round



Concrete Clothes Posts Are Everlasting.

rods placed in each corner so that they will come $1\frac{1}{2}$ inches from the outside surface.

The form for the post may be made of 1 inch lumber cut so as to give the dimensions noted above, or if a smooth floor or walk is available, only the sides and ends of the box need be used, the floor or walk serving as the bottom of form.

Stiffening cleats should be placed across the open side of mold to keep the side forms from bulging when the concrete is placed in the mold.

Do not remove the form from the green post until it has thoroughly hardened, which generally requires 2 or 3 days. Allow the post to cure or harden for one week before erecting.

During the first two days keep the post wet and cover with canvas, burlap, straw or other clean material, and dampen it thoroughly each day for about a week.

The form should be oiled or soaped before the concrete is placed.

The mixture used should be in the proportion of 1 part of cement, 2 parts of sand and 4 parts of rock or gravel not greater in size than 1 or $1\frac{1}{2}$ inches. Bank run gravel should not be used but should be screened, passing over $\frac{3}{8}$ inch and $1\frac{1}{2}$ inch mesh sloping screens, the material which passes through the $\frac{3}{8}$ inch screen being called sand and through the $1\frac{1}{2}$ inch screen and retained on the $\frac{3}{8}$ inch screen gravel. All measurements should be made with the material poured loosely into the measuring box and the box, when full, should be completely leveled. If, for any reason, the concrete stands thirty minutes before using, it should be thrown away, for cement, once it has partially set, makes weak concrete, even though it is retempered by turning or adding water.

After depositing $1\frac{1}{2}$ inches of concrete in the form, carefully spade it and then place the reinforcing rods $1\frac{1}{2}$ inches from the side forms. Continue filling the form, spading thoroughly, meanwhile, until within $1\frac{1}{2}$ inches of the top, then place the last two reinforcing rods $1\frac{1}{2}$ inches from either side form. Then fill form completely and neatly trowel or smooth the concrete.

Too much emphasis cannot be placed on the spading of concrete because it is essential that the surface of the concrete be dense and free from voids. No air bubbles should be allowed to form. If considered desirable, convex molding can be placed along the square corners of the mold, thus giving a rounded corner which will not fray the clothes line.

PLANT EXCLUSIVELY FOR MANUFACTURE OF FENCE POSTS

An interior view of a concrete products plant devoted exclusively to the manufacture of fence posts, is shown in Fig. 1. This is the plant of the National Staple Post Company, 454 West Home street, Westerville, Ohio, and is practically the parent plant using the R. B. Bennett patents and process which are controlled by the Staple Post Mold Company, Westerville. This is the post into which staples or nails can be driven.

The equipment of the plant is simple and the operations are chiefly in two parts: First, assembling the reinforcing—an operation which occupies but a small space, and second, making the posts themselves. The line post is triangular in section with rounded edges and the reinforcing rods are held in place by means of spacers stamped out of thin metal. The spacers are shaped like the letter "V" and have holes stamped out at the apex and at the ends to receive the rods. The spacers are held in position by being set into slits sawed in a 2x4-inch on a horselike frame. The hole at the bottom of the spacer projects at the top of the frame and the other two holes at the sides. The reinforcing units are quickly assembled and piled up where they are in easy reach of the man molding the posts.

The metal molds nest conveniently and are also within easy reach.

The mixer used in the Westerville plant was furnished by the American Cement Machine Company, Keokuk, Iowa. The $1:1\frac{1}{2}:1\frac{1}{2}$ mix of cement, lake sand and limestone is run quite wet into a box at the end of the trough, as shown in Fig. 1, and is scooped up by the man making the posts. Usually six molds are racked at one time and when each has been filled to within half an inch or so of the top, a special tool is used for placing the composition material which forms the nailing strip in one side of each post. This tool is essentially a trough 5 feet long (the length of the nailing space) and is so made that the bottom of the trough is closed when it is inserted down into the center of the post being molded. The top of the trough is wide so as to receive the special mixture

and when the trough is filled, the mixture is tamped into place by means of a strip of metal which is inserted at the top of the trough throughout its length. When forced down this long tamper opens the trough at the bottom, forcing back the concrete and making way for the mixture which forms the nailing strip. The operation itself is much more rapid than its description. When filled, the molds are set in a rack on a car.

There is one item of equipment not shown in the

MIXING OF MORTAR COLORS

The demand for mortar colors is becoming greater every day. Not only are dealers and contractors taking to the artistic methods of laying brick in colored mortar, but building owners are realizing the attractiveness which may be secured through the use of the various mortar colors now available.

Believing that the retailers of mortar colors would benefit from information concerning the mixing of



Fig. 1.—Interior View of Concrete Products Plant Devoted Exclusively to the Manufacture of Fence Posts.

illustration—a vibrating framework to support the molds while being filled, which obviates any necessity for puddling of the concrete to get density. This was not in use when the photograph was made.

A 4-horsepower Cook motor drives the mixer. Two barrels of cement and one yard of aggregate make seventy-two line posts 7 feet 6 inches in length. Line posts may also be made in any other lengths. In section, line posts are $3\frac{1}{2} \times 3\frac{1}{2} \times 4\frac{1}{2}$ -inch. Corner and gate posts are made in various sizes, principally 6x8-inch by 9 feet, and 8x10-inch by 9 feet. A line post weighs only about fifty pounds. One man's record at the plant is

these materials, the Ricketson Mineral Paint Works of Milwaukee, Wis., is supplying them with this information.

"The amount of coloring needed varies with the materials used and the shade desired," says Mr. Frederick C. Bogk, secretary and treasurer of this company. "For mortar, the following is approximate: For laying 1,000 brick with spread joints in red, brown, buff or purple, use from 50 to 60 pounds of color to two and one-half bushels of lime and one-half yard of sand. For buttered joints, use 35 pounds of color. For dry black, use from 80 to 100 pounds. For laying



Fig. 2.—View of Yard at the Plant of the National Staple Post Company.

279 posts in a day. Posts are left in the steam rooms forty-eight hours, and are then stacked or piled in the yard. Fig. 2 is a view of the yard at Westerville.

The Westerville plant operates most of the year, using more than 1,200 line molds with many sizes of corner post molds. Mr. Bennett began the manufacturing, but the business grew so that the National Staple Post Company was organized, so that Mr. Bennett now gives his time to the Staple Post Mold Company, 454 West Home street, Westerville, Ohio, which equips other plants.

1,000 pressed brick with spread joints, using black pulp colors, take from 40 to 45 pounds of black pulp to two and one-half bushels of lime and one-half yard of sand. For buttered joints, use 25 to 35 pounds of pulp.

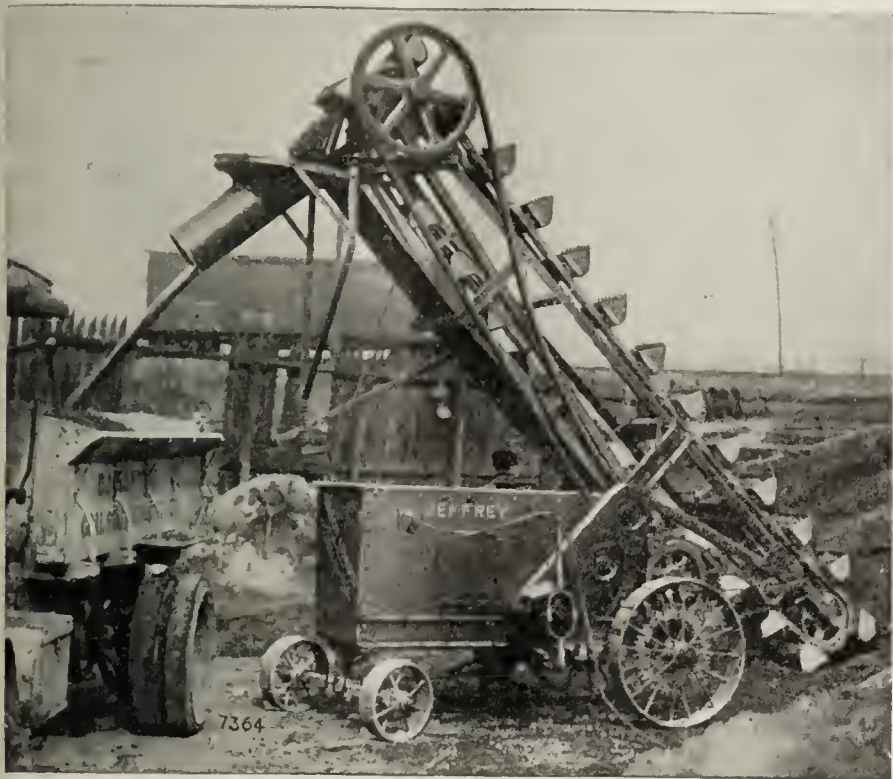
"Slaked lime should be allowed to cool not less than 48 hours before adding to the mixed sand and color in making mortar.

"Always mix the colors with dry material. The more thorough the mixture, the less coloring you will need."

JEFFREY WAGON LOADERS

The many uses to which Jeffrey Wagon and Truck Loaders are adapted are shown in their new Bulletins Nos. 165 and 166, containing Illustrations, Specifications and Prices on their various types.

These bulletins describe in detail their Standard Types of Loaders for handling Coal, Crushed Stone, Sand, Gravel, Clinker, Ashes and other loose materials.



Their Heavier Types of Loaders for handling Bituminous Coal, Crushed Stone, etc., are self-propelling, easily operated by the ordinary yard laborer, and can be moved from pile to pile under their own power. These machines have a capacity of 1 to $1\frac{1}{4}$ tons of coal per minute; will handle 1 to $1\frac{1}{2}$ cubic yards of Stone, Sand, Gravel and other heavy materials, maxi-

SAND AND GRAVEL

The total production of sand and gravel in the United States in 1913 reported to the United States Geological Survey, was 79,555,849 short tons, valued at \$24,217,508, a net increase in quantity of 11,201,286 short tons and in value of \$1,104,300 over the production of 1912. Sand for building purposes constituted nearly one-third of the total production. In 1913 a production of 25,397,383 tons of building sand was recorded with a value of \$8,007,940. This is an increase in quantity of 1,621,370 tons and in value of \$39,822 over the production of 1912.

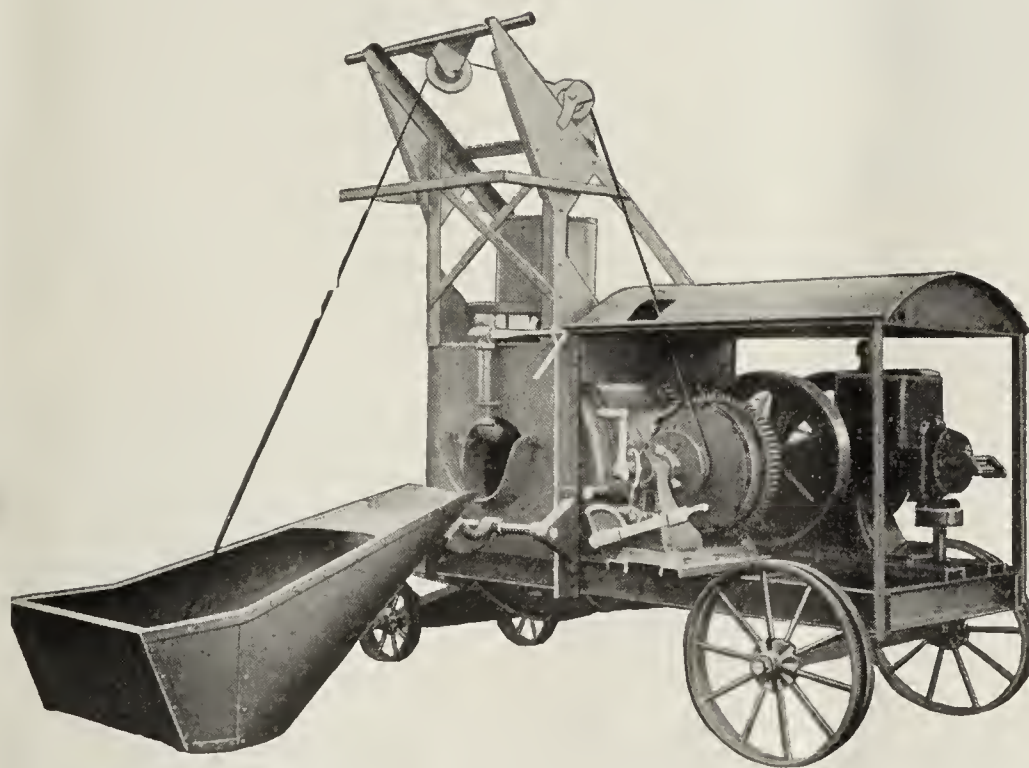
SILOS OF CONCRETE BLOCKS

The Zagelmeyer Cast Stone Block Machinery Company, 25 Cramp street, Bay City, Mich., announce that they have perfected molds for making concrete silo blocks, by wet process system and with granite facing. "We furnished blocks last year for two silos, which were erected late in the Fall and are very pleased to report that both customers are very well satisfied and claim that not a particle of the silage was frozen or effected in the least thus far this winter and we had some real cold weather in this locality during the month of January, when the thermometer registered as low as eighteen degrees below, for three or four days at a time. This we think is a remarkable record."

NEW LANSING CATALOG ON BATCH MIXERS

In a handsome new catalog being sent out by the Lansing Company, Lansing, Mich., the new Lansing concrete batch mixer takes the leading place. This machine is now being made in five sizes, Nos. 5, 7, 10, 12 and 15, the number in each case representing the capacity per batch in cubic feet of loose material.

These mixers are furnished either on skids or trucks, and with steam engine, gasoline engine, or electric motor; also with standard hopper or with power loader, or batch hopper. It will be seen, therefore,



"The Lansing Batch Mixer." Made in 5 sizes, Nos. 5, 7, 10, 12 and 15.

mum size of crushed stone $3\frac{1}{2}$ -inch ring. The Light Weight Hand-Propelled Loader, especially designed for handling Anthracite Coal, has a capacity of $\frac{1}{2}$ to $\frac{3}{4}$ ton per minute, and is equipped with a Feeder Attachment which pulls the coal into the buckets and eliminates the necessity of having a man on the pile to push the coal down. Fitted with Screen and Dust Hopper, and if desired, the latter is made in combination with a Bagger. Write for catalog. Jeffrey Manufacturing Co., 914 No. Fourth St., Columbus, Ohio.

that a wide range of demands can be accommodated. This machine has been designed to connect up very closely with the needs of contractors and products manufacturers, and is very rapidly making friends.

The catalog also includes the well known line of Advance continuous mixers made for a number of years by this company; also the Lansing mortar mixer, gasoline hoist, wheelbarrows, etc.

A copy of the catalog No. 354 will gladly be sent to all readers on application.

hoist is geared to this engine, and is used for moving the hopper bottom cars to and from their positions over the unloader. The engine and hoist are mounted on a rigid I-beam frame. The conveyor elevator has a heavy wood frame of ample size to secure great strength and rigidity. It is stated that the engine uses very little more than five gallons of gasoline per day.

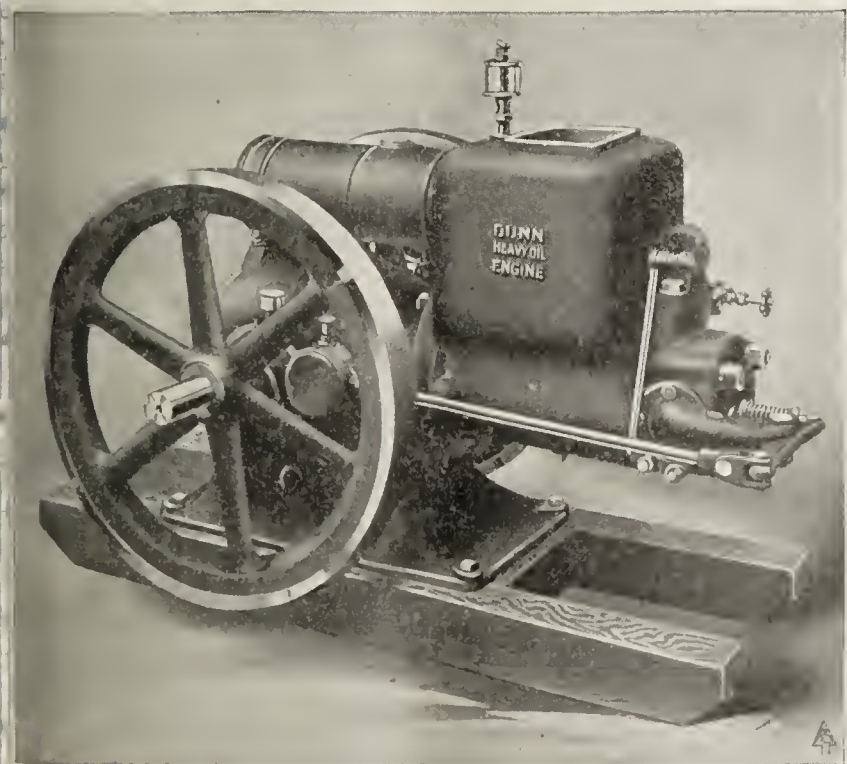


Portable Bucket Conveyor for Unloading Hopper Bottom Cars.

In installing the machine all that is necessary is to dig a trench at a convenient unloading point under the railroad siding, installing in the trench a suitable bottom discharge, steel hopper, with a controllable discharge gate, which is furnished with the outfit, and attached to the ties by lag screws. The operator can control the speed with which the wagons are unloaded by speeding the conveyor belt or regulating the amount of material discharging from the hopper. The weight of the outfit complete is about 8,500 pounds, and the mechanism is so simple that it can be set up by any ordinary mechanic.

This is a machine that will save many times its own cost on single jobs, if the job is of any considerable extent, and it is a machine that should be in the hands of every contractor, or any other person who has large quantities of sand, gravel, crushed stone, or fine coal to handle in a short time.

The entire outfit was built and furnished by Chanon Company. Catalog illustrating and describing this machine will be mailed to interested parties by addressing Cement & Engineering News, Transportation Building, Chicago.



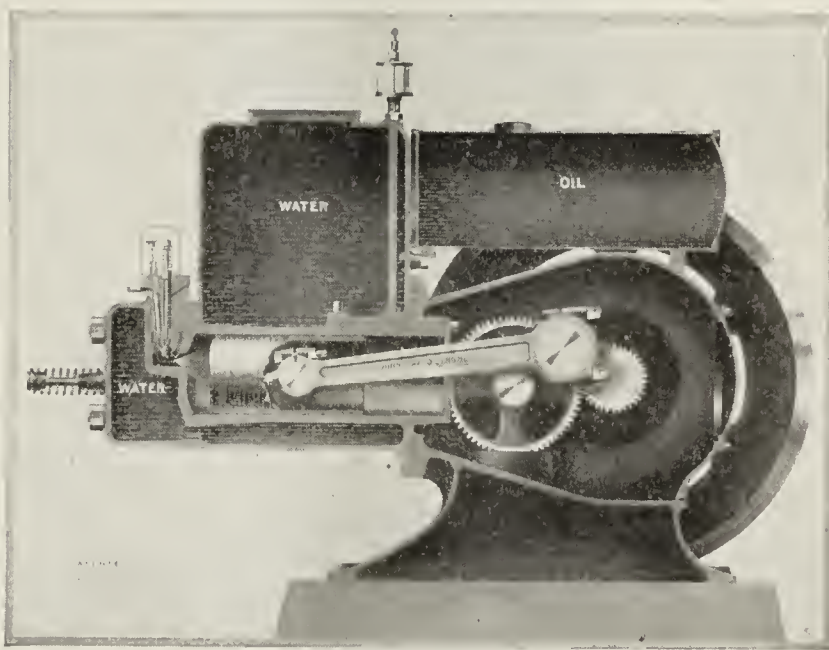
Three-Horsepower Dunn Heavy Oil Engine.

A WONDERFUL NEW OIL ENGINE

What is undoubtedly a revelation in the principle and operation of internal combustion engines, is represented by the Dunn Heavy Oil Engine, now being placed on the market by the W. E. Dunn Manufacturing Company, makers of the well known line of concrete machinery and molds.

What, to the average power user, is the most striking feature connected with this engine, is the total absence of electrical ignition, carburetor and other mechanism which hitherto has been part and parcel of practically every other internal combustion engine on the market. The Dunn engine neither uses nor requires batteries, magneto, spark plugs, mixing valve, timer, switches, igniter, spark coil, hot ball, hot tube, spray nozzle, nor any other delicate mechanism or parts. Electrical ignition and carburetors from over 80 per cent of all internal combustion engine troubles, and the elimination of such parts must result in a power unit of unparalleled efficiency and reliability.

To those acquainted with the operation of engines, the combustion of the fuels without electric ignition or pre-heating appears impossible. With one exception it is impossible, the one exception being the Dunn engine, which, by means of a patented fuel cup, or combustion chamber, obtains perfect combustion entirely by air compression. This principle has been



Sectional View, Dunn Heavy Oil Engine.

proven successful by one or two European engine builders, but it is in the Dunn engine that it has been brought to its highest state of perfection.

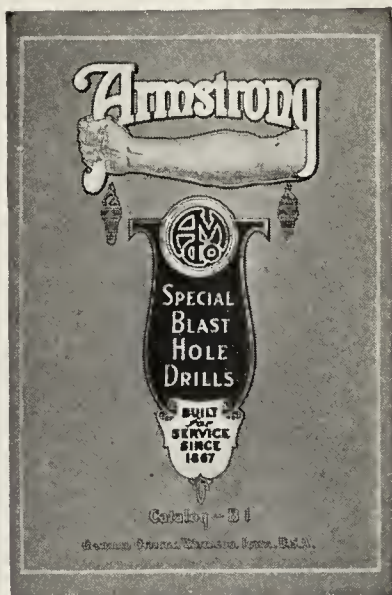
Another feature, equally as important as those of simplicity of construction and operation, is the fact that the Dunn Engine will burn the heaviest, cheapest oils produced. Fuel oils, residuum oils and similar fuels that can be bought for 4c to 6c a gallon will perform just as satisfactorily as kerosene and lighter distillates. Compare these fuel costs with gasoline, or even with kerosene as used in the ordinary kerosene engines (usually called "oil" engines), and the fuel economy of the Dunn Engine can be readily appreciated. And don't forget that the Dunn Engine eliminates the costs of batteries and spark plug renewals, which form quite a large item in the expense of operating gasoline and other oil engines. In round figures, which are really conservative, a Dunn Engine developing six horse-power under full load, can be operated at a fuel cost of 24 cents per ten-hour day.

While no attempt has been made to promote its sale until the builders had tested it out thoroughly, quite a number of these heavy oil engines have been in service for upwards of two years and practically, without exception, have more than fulfilled the expectations of both the manufacturers and users. This

discounts any idea of its being in the nature of an experiment. The accompanying illustrations show its clear cut design and entire freedom from small parts. It is hard to imagine a better source of power for contractors' use, from running a number of machines by means of line shaft and pulleys, to running individual machines such as concrete mixers, pumps, saw rigs, hoists and many others. Full information on specifications, sizes, prices, etc., can be obtained by writing the W. E. Dunn Manufacturing Company, 4139 Fillmore street, Chicago.

SPECIAL BLAST HOLE DRILLS

An elaborate and quite instructive publication, catalog B1, issued by the Armstrong Manufacturing Co., Waterloo, Ia., manufacturers of all kinds of well drilling machinery, prospecting and blast hole drills, oil, gas and gasoline engines, etc., should be in the hands of all interested in drilling operations. The title of the catalog is "Special Blast Hole Drills." Aside



from its features of elegant printing, attention may be directed to its exhaustive and authoritative text covering a subject that is of vital interest at this time to every one connected with the quarry trade, viz., the material reductions in operating costs, and the resulting cumulative profits obtained by following the example of many leading quarry operators in adopting special blast hole cable drills for blast hole work. Within the booklet are, aside from its very complete reading matter, many illustrations of the drills and their parts. The drills are shown in operation at various points and a thorough discussion of the conditions met with supplements the picture.

CORRUGATED FENCE POSTS

A prominent feature of the Indiana corrugated fence posts, made on the steel molds of the Indiana Concrete Mold Company, 216 East River street, Peru, Ind., is the corrugations that enables the fence builder to secure a firm hold with the fence wire wherever desired. The tie wires bind the fence wires firmly into this corrugation and there is no slipping or sliding.

These fence posts are made either sectionally or in sets. The concrete is poured into the mold and shaken sufficiently to assure it of a proper density when set. The molds are then carried away and allowed to cure for a period of from four to eight days, when they are permitted to harden for a period of from 30 to 90 days. There is a growing demand for concrete fence posts made on the molds of the Indiana Concrete Mold Company and building material dealers and concrete product manufacturers will profit by investigating the merits of these posts.

Prices and terms will be gladly sent to readers of

the Cement & Engineering News upon request. Address the Indiana Concrete Mold Company, 216 East River street, Peru, Ind.

WET MIX CONCRETE BLOCK SYSTEM

The Zaegelmeyer Cast Stone Block Machinery Company, 25 Crump avenue, Bay City, Mich., is furnishing concrete block manufacturers with molds and machinery for the manufacture of superior building blocks by the use of wet concrete. The Zaegelmeyer system of casting hollow blocks aims to eliminate the defects of the dry tamp system, and to produce a block which will be a true imitation of stone, will be economical and will have great frost resisting qualities.

The feature of the system is the use of wet concrete. Enough water is added to bring the concrete to such a consistency that it will flow freely in the molds. This insures perfect crystallization, great density, freedom from voids and sharp outlines. Such a block has strength, and does not absorb moisture, which insures against dampness and damage by frost. The greatest disadvantages of the dry tamped block are thus eliminated.

To make blocks which will closely resemble stone and which will have individual faces, the face plates are made of cast iron, in a large number of varieties, the impressions being taken direct from actual rock faces. The strength and economy result from the method of manufacture. A separate steel mold is provided for each block, so it may remain undisturbed twelve to twenty-four hours, and the cores are collapsible and of uniform diameter, economizing material. These molds are mounted on flat cars in groups of twenty to the car. A specially prepared layer is laid down on the face plates and the car then run under the mixer, where wet concrete is poured in and allowed to stand until set, when the centers are collapsed and forms readily taken down. A number of molds equal to the capacity of the plant is required and each mold is used once a day.

The cost of manufacture under this system is low and the product is of a very high grade.

The company builds complete plants of capacities ranging from 500 blocks per day upward, or sells the cars and molds for such plants separately.

ELECTRIC FURNACE STEEL CASTINGS

At a meeting of the American Electrochemical Society held at the Chemists' Building, N. Y., April 10, 1914, two papers were presented, one by C. A. Hansen of the research laboratory of the General Electric Company, Schenectady, N. Y., entitled "Electric Steel Castings," and the other by E. B. Clark, President Buchanan Electric Steel Co., Buchanan, Mich., on "Electric Furnaces for Steel Making."

A complete report of this meeting was published in The Iron Age, April 23, 1914, Vol. 93, No. 17, from which we quote as follows:

"Edwin F. Cone, The Iron Age, New York, said that the superiority of electric furnace steel castings, chemically and physically, had not been sufficiently emphasized; that steel from the electric furnace, because of superior refining conditions, was not only purer chemically, especially as regards sulphur, but that castings poured from it have a higher static value for the same composition than those made commercially by any other process. Not only was this true as regards tensile strength, but their elastic ratio was decidedly higher, equaling in many cases that of acid open-hearth castings with vanadium, other conditions being equal. It was also true, he claimed, that dynamically electric furnace steel castings surpass any other kind, other conditions being the same. Main

sts confirmed these contentions, among which were those published in The Iron Age of May 29th, 1913, made on steel castings from the Treadwell Engineering Company's furnace, in Easton, Pa.

"Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa., expressed the opinion that there was no doubt about the superiority of electric steel castings because of the refining action, which was impossible in any other process, and the contention was supported by Mr. Hibbard, consulting engineer, Plainfield, N. J. Mr. Cone felt it necessary to add that it was a self-evident fact that the purer a steel, the better its properties, and that the superior purity of electric furnace steel was unquestionable."

COSTS REDUCED BY MONOLITHIC CURB, GUTTER AND PAVEMENT

By casting concrete curbs, gutters and pavements as monoliths the cost of highway and suburban road construction in the Middle West has been considerably reduced. The reason usually given for including the curb with the pavement is the greater economy over the usual type of curb and gutter, the cost of which runs from \$3,500 to \$5,000 per mile. The bid cost for curbs often bears little or no relation to the actual cost, but is largely a matter of custom. Integral curbs add but a small amount in yardage of concrete, and the cost, depending on the type, should not be more than one-fifth to one-tenth of the above figures. Distributed over the total area of the pavement there is added but a few cents per square yard to the pavement cost.

Of the various types those used in Glencoe and in Highland Park, Illinois, seem to be the ones more generally favored for suburban pavements. Where a former macadam road existed and the parking was sloped down to meet the pavement at the lowest point, the Winnetka type has worked out well. With reinforcing in the slab it is usual to place the concrete in two layers, adding the curb with the second coat. Carpenter braces are used to hold a form board against the curbs in constructing concrete curbs in Highland Park. This work is being carried out by H. G. Goelitz, contractor. On flat grades the curb height varies between inlets from 2 to 8 in.

Where the pavement is laid in one course some form of curve gutter is used, as exemplified in the Geneseo and Winnetka sections. The strike board is then cut away to give the proper shape. In the Highwood job the cinders were rolled into a rather soft subgrade to stabilize the foundation. Steel forms for building concrete curbs and gutters are made by the Heltzel Steel Form & Iron Works, Niles Road, Warren, Ohio.

MEDUSA WATERPROOF WHITE PORTLAND CEMENT

We are pleased to acknowledge the receipt of one of the first copies from the press of a catalog of Medusa waterproofed white Portland cement. This is sent out by the Sandusky Portland Cement Company, Sandusky, Ohio, manufacturers of this popular brand of cement, and it is a complete exposition of the qualities and advantages of Medusa white, together with full directions for using it in various locations and to obtain various results.

The booklet is full of information and pictures, the latter showing some handsome pieces of work on which this cement has been used.

We believe many of our readers will be interested in the combination of waterproof qualities and decorative possibilities which this cement presents, and we are advised by the Sandusky Portland Cement Company that copies of the booklet will gladly be sent to those interested.

ROAD CULVERTS

One bad, or ill-made culvert can spoil all the pleasure of riding over miles of good roads. They are also responsible for most of the accidents and deaths met with on the roads by automobile users. When one is traveling a good road and the going is smooth and pleasant he is likely to forget that in the middle there may be a culvert, perhaps not over five feet wide, made of planks that have sunk below the common level; or a plank is torn up or banks of mud deposited on one side or the other that give the vehicle a hard jolt and if the driver is not carefully holding his wheel and attending to his business as driver, he may be suddenly thrown to one side and ditched. Many lives have been lost through bad culverts on good roads; they are a snare for even the best drivers of motor propelled vehicles. The first thing to consider in building good roads is to provide for good culverts, that the most dangerous parts of roads on account of grades may be at least as safe, if not safer, than the main part of the road. Concrete is the only proper material with which to build strong, enduring culverts. Booklets and information for building concrete culverts will be mailed, free of charge, on request to Merrillat Culvert Core Company, Dept. G, Winfield, Iowa.

FLOOR SURFACING MACHINE

The machine illustrated on this page is the latest type ball bearing Schlueter floor surfacer for mosaic, marble, composition or wood floors. It saves time and labor. This rapid, electric surfacer is the most simple constructed machine on the market. It has no gears or clutches to wear out. Direct chain drive



and automatic dust collector. Mr. Schlueter declares that he has sold over 5,000 floor surfacers throughout the world. Made in various sizes.

You can test and try this machine before you buy. Send for prices and free trial offer. M. L. Schlueter, manufacturer and patentee, 225 W. Illinois street, Chicago.

PERFECTION STAVE SILOS

Perfection silos are built of concrete staves made of a wet mix, and with all-steel doors.

The manufacture of the staves and the construction of the silo are reduced to the simplest terms, so that any one who knows anything about concrete can attain immediate success in this work.

The units can be made either in the shop or on the job. They can be made in wet or cold weather and erected when conditions are more favorable.

These silos prove immediately popular, so that each one built helps to sell others.

Exclusive territory is offered to builders by the Perfection Stave Silo Company, 506 Clapp Bldg., Des Moines, Ia.

The Electrical Equipment of the Allentown Portland Cement Plant

From the Raw Crushing Department to Stock House all Operations in this Modern Cement Mill are Made More Simple and Economical by Electric Motor Drive

The electrical features of the Allentown Portland Cement Company of Evansville, Pa., are of interest in that the Company's plant is typical of the latest cement mill practice. As the mill was constructed by the Fuller Engineering Company, which Company has built several of the best cement mills in the country, its design can be accepted as a standard of the day. It has a capacity of 2500 barrels per day with arrangements for increasing this to 5000 barrels per day without interrupting production. The operations in the mill and their sequence are as follows:

At the quarry the rock is loaded onto dump cars with a Marion steam shovel. Two hoists, each driven by a 50 h. p., 750 r. p. m., wound rotor motor, take these cars up an incline to the crusher house. The cars discharge into an elevator which discharges into a No. 10 Gates crusher. This crusher discharges into a second elevator which delivers the material to three No. 6½ Lehigh crushers, where the material is further reduced. A 250 h. p. motor supplies the necessary

In this mill the material is delivered to two No. 8 Krupp ball mills, each driven by a 40 h. p. motor. These mills are used in preparing the mixed raw materials for the Fuller mills. The material is discharged from these ball mills on to several elevators driven from line shafting belted to a 40 h. p. motor. These elevators distribute the material into a storage bin over the Fuller mills by means of a screw conveyor. The material is fed from the bin into eight 42-inch Fuller mills, each driven by a 75 h. p. vertical belted motor. These vertical motors are operating very successfully and have proved distinctly advantageous as compared with horizontal motors with quarter turn belts. The material is conveyed from these Fuller mills to a large storage bin over the kilns by means of a bucket hoist driven by a 10 h. p. motor. The material is conveyed into each kiln by an inclined feed pipe which receives its supply from the screw conveyor. There are four kilns 8 ft. by 120 ft. each driven by a 30 h. p., 750 r. p. m. type HF motor.



Allentown Portland Cement Mill, Evansville, Pa. Furnishes One of the Best Examples of Motor Drive for Cement Mills. Westinghouse Motors Used Throughout.

power for the crushing machinery. It is interesting to note here that although individual drive was adopted through almost the entire plant, line shaft was installed in the crusher house. The reason for this is that the load on a gyratory crusher is intermittent and frequently comes on so quickly that it constitutes a severe shock; by using line shaft drive a shock produced by any particular machine can be absorbed by the inertia of the other machines and moving parts of the system. The discharge from the smaller crushers is lifted to conveyors which carry the material to the large bins adjoining the driers. The storage bins are equipped with automatic shaking feeds, by means of which a constant flow of material to the driers is effected.

The accompanying illustration shows details of the motor on the driers. In this case a 50 h. p., 470 r. p. m., type CCL motor is belt connected to a line shaft from which three 7 ft. by 50 ft. driers are driven. Each drier is connected to the line shaft by belt drive and the speed is further reduced through two sets of spur gears and one set of bevel gears. As will be seen in the right foreground of the picture, bearing ring rollers idlers are placed sufficiently close together to preclude large bending moments. The 50 h. p. motor mentioned also supplies power to the shaking feed arrangement from the stock bins to the driers.

From the belt driers the material is carried to the stone storage on a belt conveyor driven by a 40 h. p. motor. A smaller conveyor driven by the same motor takes the material to the raw mill.

The coal for firing the kilns is brought from a hopper below the tracks and carried by means of an elevator and conveying system driven by a 40 h. p. motor to the top of the coal storage. The material is conveyed by gravity into a set of rolls in the pit which reduces the large lumps. An elevator discharges the crushed coal into two 4½ ft. by 30 ft. Matcham driers, from which the material is again elevated and discharges into the bins over the pulverizers. The pulverized coal carried by a screw conveyor and an elevator to the bins in front of the kilns. One 30 h. p. CCL motor drives the three elevators and the screw conveyor handling crushed and pulverized coal. The pulverized equipment consists of two 42-ins. Fuller Lehigh mills driven by a 75 h. p. motor. The motor for each kiln is placed in the small pit below the surface of the concrete floor, small openings in which permit the passage of the belt to the pulley seen on the three bearing shaft visible in the foreground of the picture. Further speed reduction is effected through two belts, one bevel gear and two spur gear connections.

The speed rotation of the kilns is low, about 1 and 1½ minutes to the revolution. Provisions must be made in the motor drive to vary the speed of the kiln to suit the charging conditions in burning. In some alternating current installations, using induction motors, a motor generator set has been provided to supply direct current for operating the motor for the kilns

but in the plant under discussion alternating current slip-ring motors with wound secondaries were chosen and have operated with entire satisfaction, the speed

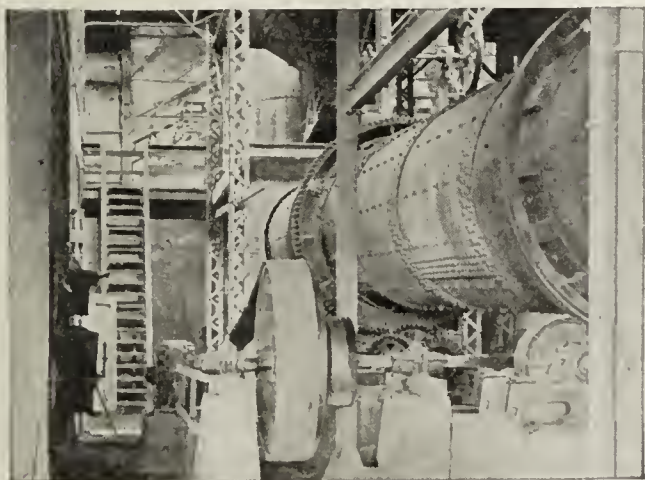
changes being obtained by varying the resistance in the secondary of the motor.

Two kilns discharge into a common bucket elevator which feeds the material into the rotary coolers. There are four coolers all operated by 50 h. p. motor. The two bucket elevators for these are driven by a 20 h. p. motor. A belt conveyor takes the material from the coolers and delivers it to an elevator discharging on to a belt conveyor, which distributes the clinker to the storage.



75 H. P. Westinghouse Motor Driving Fuller Mills.

From the storage where the clinker is permitted to season it is taken to the gypsum house by means of a belt conveyor driven by a 10 h. p. motor; an elevator driven by a 10 h. p. motor takes the material to the finishing mill where it is discharged into a rotary screen, with $\frac{3}{4}$ " holes. The material which passes through then goes directly to the eight Fuller-Lehigh finishing mills each of which is driven by a 75 h. p. vertical type motor. The coarse material is fed into a No. 8 Krupp ball mill, and the resulting product from the ball mill is discharged into the same elevator that delivers the material to the Fuller mills. The ball mill is driven by a 40 h. p. motor. Between the rows of finishing mills there are two conveyors discharging into the common elevator that delivers the material to a screw conveyor connecting the finishing mills with the store house; this system is driven by a 40 h. p. motor. Three screw conveyors, all driven from a 30 h. p. motor, carry the material from the bins in the stock house to the bagging house, and a 20 h. p. motor supplies the power for the elevator that delivers the cement to bins above the baggers. Two pairs of Bates valve bagging machines are used for bagging the cement, each pair being driven by a 30 h. p. motor. Each building has its separate control panel, distribu-



50 H. P. Westinghouse Motor Driving Rotary Dryer.

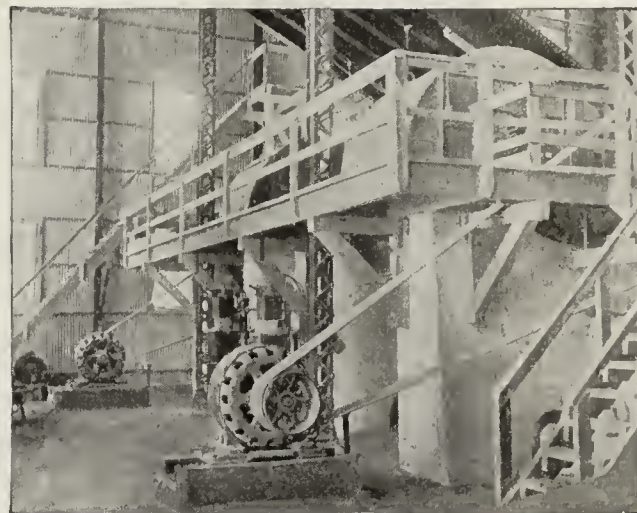
tion to which is made from the power house about 1300 feet distant by means of 4-0 B. & S. G. wire. Energy is generated by three Westinghouse 937-Kw., 600-volt, 3-phase, 250-cycle, 100 r. p. m. alternating current generators direct connected to Wetherill cross

compound engines. The exciter unit consists of a 150 h. p. alternating current type CCL motor driving a 100 Kw., 125-volt generator at 720 r. p. m.

In a cement plant the power demands are more exacting and the operating conditions are more severe than in other manufacturing processes. The presence of great quantities of highly abrasive dust, the inflammability of the finely powdered coal, the heavy torque required by the machinery and the nature of the load all go to make up a problem in motor drive that requires the most careful consideration for its solution. Induction motors have solved the problem. The Allentown Portland Cement Company's plant furnishes one of the best examples of motor drive for cement mills. Great simplicity has been effected in the layout of the machinery. Individual drive on the principal machines, including those of burning and grinding departments, offers the advantage that expensive and troublesome clutches are unnecessary and also that during the shut down periods of any particular machine the entire friction load of that unit is nil. With line shaft drive the use of even one machine of a department means an exceedingly heavy friction load.

CONSTANTINOPLE CEMENT PLANTS.

Two factories furnish the greater part of the cement available in the consular district of Constantinople. Their combined yearly output is 450,000 to 500,000 sacks, all of which is at present being taken by the military authorities. The quality of this product varies, but is always poor, there being no uniformity as to either hardness or color. Student-Interpreter Charles E. Allen, Constantinople, says the point, with



50 H. P. Westinghouse Motors Driving Raw Dept. Machinery.

reference to cement, that should be of particular interest to the American exporter is that, with the close of war, building construction is certain to be begun on a large scale in this part of the world. It needs no engineer or business man to detect the trend in this direction.

Two opportunities are offered the American cement manufacturer. He may enter the market and sell his share of the cement that is going to be bought abroad. In that case he will be at a disadvantage in competing with his European rivals because of freight rates, which, in the case of heavy articles like cement, have been found to be in the past practically equal to the cost of the goods delivered on the docks at New York. The matter is, nevertheless, worth investigation by firms in a position to charter ships and send cement here in large quantities.

On the other hand, there is an opportunity for the investment of American capital in the construction of a cement factory. I am assured that all the materials that go into the manufacture of cement are available and there is necessary only a modern factory, properly managed, to turn out cement equal to any that is manufactured elsewhere.

UNIFORM METHODS OF COST ACCOUNTING

By C. H. Sondhaus

It is the purpose of this article to discuss the question of uniform cost accounting, in its relation to the cement industry of this country.

The four principal functions of any business are producing, selling, financing and accounting. These are of equal importance, and, if the enterprise is to be successful, no one of these functions can be neglected. In the past a great deal of attention has been given to producing and selling. But the accounting function has been neglected, or at best, thought of as a source of expense, which is to be kept at an absolute minimum. We are, however, emerging from that period of thought. The accounting function has begun to be

this need some time ago, and started work on a uniform cost sheet, also a book of instructions for its use.

Uniformity in cost finding means uniformity in price. What manufacturer knowingly sells below actual cost, unless business policy dictates it? Yet how often must we meet prices which are below cost, or lose orders? But suppose our competitor does not know his exact cost, and sells under the impression that he is making money? As long as he lasts, he dictates our prices. It is then useless to us to have an exact cost system.

We should be very willing to help educate this sort of competitor in the science of cost accounting.

The use of scientific cost finding methods will show up many a weak spot in our mill operations. It will

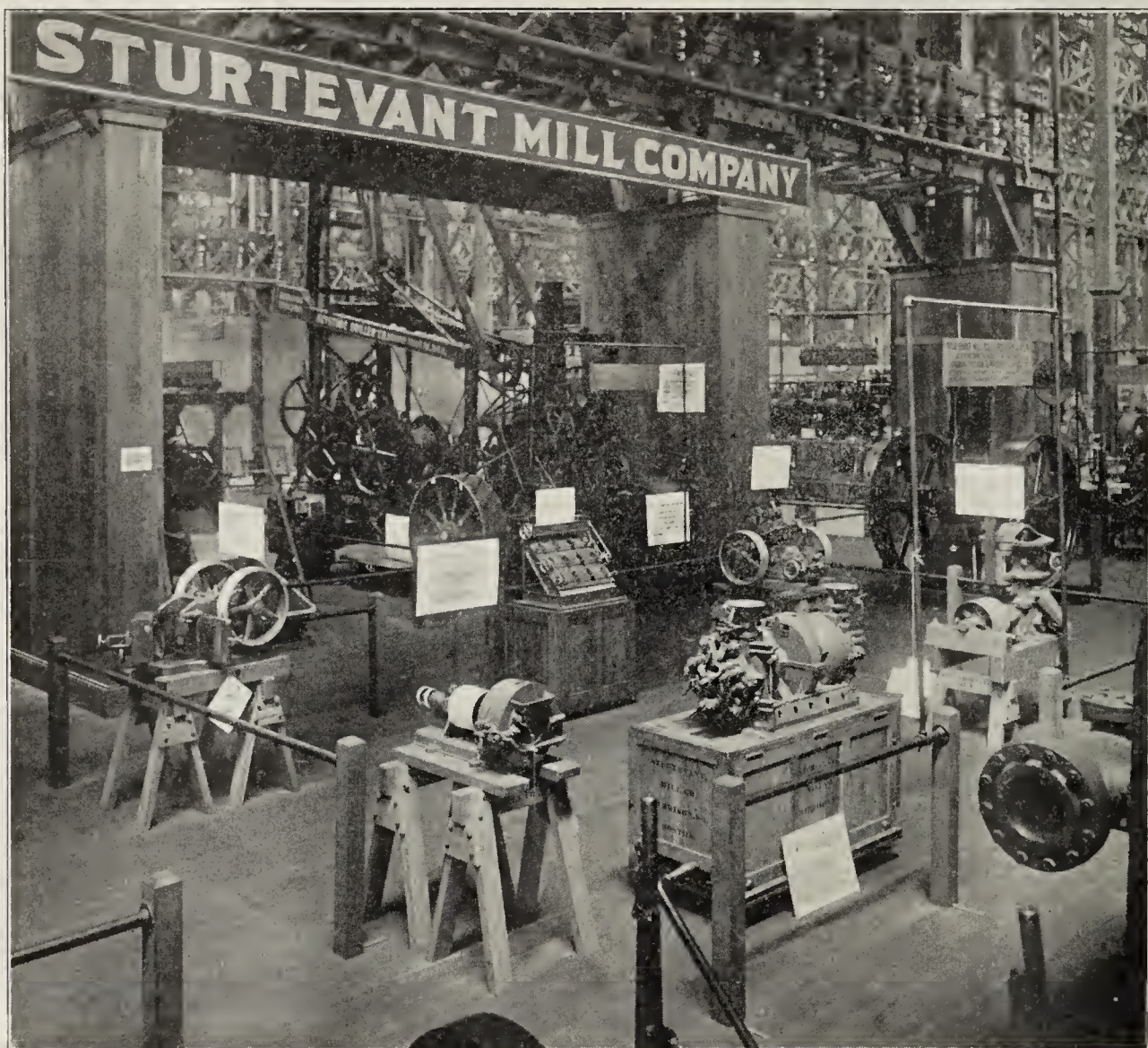


Exhibit of the Sturtevant Mill Company at the Panama-Pacific Exposition. The Exhibit Consists of Rock Crushers, Crushing Rolls, Ring-Roll Mill, Newaygo Separator, Rotary Crusher and Laboratory Machinery. All of these Machines Are Models of the Full-Size Articles in Miniature, but All are Exact Copies and May Be Operated. This Exhibit Is in Charge of Their San Francisco Representatives, Messrs. Harron, Richard and McCone.

considered as a mirror, which should be used to reflect the other functions of the business. Especially is this true of the productive end of the business, in its relation to costs. Scientific cost accounting detects leaks before they sink the ship. From often being considered a source of useless expense, accounting has come to be regarded as being essentially productive in its nature. Without cost accounting no enterprise can exist. It becomes, therefore, of deepest importance that cost accounting be scientific and exact. It behooves us, as cement manufacturers, to search for, and adopt those methods which have proved most efficient and successful.

These methods should be uniform, and should be used by every manufacturer. The Association of American Portland Cement Manufacturers realized

stimulate the search for better methods of production with their consequent reduction of cost.

It has been the history of all industries that lowering the cost means the finding of a larger number of uses for the product. Suppose the cost of cement should be lowered sufficiently to remove the chief objection to the concrete road? In that event, how much more cement would be consumed annually in this use alone?

Even in years of greatest demand, the producing capacity of the cement mills is not reached. Any increase in the consumption, and consequently, in the production, means a further reduction in cost, due to lessening overhead expense per barrel.

I do not think that the manufacturers need fear another era of cement plant promotion. The day of the

ready sale of cement stocks is over. Without the support of the investing public, new plants will not be built.

If the industry can be brought to realize fully the necessity for uniformity in cost-finding methods, this question will immediately arise: by what means can each manufacturer secure the information necessary to the installation of a uniform cost sheet? The purpose of the Association committee, that of formulating this uniform cost sheet, and of compiling a book of instructions for its use, is almost completed. It now remains for the manufacturer to show his appreciation of the work of the committee by availing himself of the valuable information gathered.

The interest aroused by the consideration of cost-finding methods, will undoubtedly lead to a search for information on general accounting methods. It might be well for the Association to provide a source of information on accounting methods of whatever nature. The members of the Association should be made to

idea of the Company to store a sufficient quantity of stone during the Summer months so that they shall not be obliged to operate their quarries during the Winter. The circular storage system locomotive crane has enabled them to accomplish this with the minimum of expense and on a small piece of property. The total storage capacity is from 50,000 to 100,000 tons.

The stone is delivered from the crusher at the quarry to an underground conveyor, which feeds into an elevator located in the middle of the storage area. This elevator discharges the stone at a convenient location so that it may be rehandled by the grab bucket of the locomotive crane to the storage area, which is outside the circular track. It is also practical to use the storage area inside the circular track for storing the crushed stone, as well as the area outside the track, thus enabling the Knickerbocker Company to secure a tremendous storage for their stone.

The circular storage locomotive crane has opened up a new line of thought for storing sized crushed



Circular Storage System, Employing Link-Belt Locomotive Crane. Knickerbocker Portland Cement Plant, Hudson, N. Y.

feel at liberty to present these questions without fear of imposing upon any of the members of the cost committee. These men, already fully occupied with the affairs of their own companies, have already given a considerable amount of their own time in the service of the industry.

The question of the employment of a man competent to answer such inquiries should be considered by the Association. Uniformity in all the accounting methods would thereby be promoted, especially as related to such subjects as sacks and invoicing.

THE CIRCULAR STORAGE SYSTEM for STONE, GRAVEL, COAL, ETC.

The Knickerbocker Portland Cement Company, Hudson, N. Y., employs a 65 ft. radius Electric Crane operating a 2-yard grab bucket, under the "Circular Storage System" for storing crushed stone. It is the

stone, gravel, sand, limestones and similar material. One man handles the crane, and in some cases does practically all the work which formerly required a gang. The circular storage system has been employed for years with great success in storing bituminous coal, both at the coal mine and tidewater, as well as at industrial plants where fuel is used in large quantities, as a precaution against strikes, weather conditions, and to take advantage of purchasing when the market price is low, etc.

The patent rights for the circular storage system are held by the Link-Belt Company of Philadelphia, Chicago and Indianapolis, who designed and furnished the elevating and conveying equipment, and the locomotive crane.

NEW CEMENT STORAGE BUILDING

The Northwestern States Portland Cement Company of Mason City, Iowa, are erecting a new \$50,000 concrete storage building, 2 stories high, 250x80 feet.

HAGAR PORTLAND CEMENT CO

On June 9th a Charter was issued under the laws of Maine incorporating the Cement Company projected by Edward M. Hagar, who lately resigned the Presidency of the Universal Portland Cement Company for the purpose of organizing a company to acquire and operate a chain of cement plants to cover the territory between the Atlantic seaboard and the Rocky Mountains.

It is called HAGAR PORTLAND CEMENT CO.

Its capital stock is Twenty Million Dollars, all Common.

Mr. Hagar announces the election and appointment of the following list of officers and assistants:

Edward M. Hagar, President; Morris Metcalf, Vice-President; B. H. Rader, Vice-President and Sales Manager; Gordon Wilson, Secretary and in charge of Cost Accounting; Leonard Wesson, Assistant to President in Operation and Construction; J. P. Beck, Assistant to President in Extension Work; C. W. Lyon, Engineer of Economies; J. H. Barbazette, Superintendent of Construction.

Pending the election of a permanent Treasurer, the office will be filled by Gordon Wilson.

The General Offices of the Company are located at 208 South LaSalle Street, Chicago.

UNIVERSAL PORTLAND CEMENT CO.

R. F. Atkins, formerly Assistant Credit Manager at Chicago, has been appointed Eastern Credit Manager at Pittsburgh.

Ray S. Huey, formerly Assistant General Superintendent, Buffington Plant, Buffington, Ind., has been appointed Superintendent of the Duluth Plant, Duluth, Minn. Fred Robinson has been appointed Assistant Superintendent of that plant.

C. O. Soderquist, formerly Superintendent of Mill No. 6 at Buffington Plant, has been appointed Assistant General Superintendent, Buffington Plant.

J. H. Kempster, formerly Chief Chemist, Buffington Plant, is now Superintendent of mills 3 and 4 of the Buffington Plant.

M. S. Humphreys, formerly Chief Draftsman, has been appointed Superintendent mill No. 6 at Buffington, Ind.

LOS ANGELES MUNICIPAL CEMENT PLANT

The City Council of Los Angeles recently closed the deal with the County Supervisors whereby the county will take over and operate the city's cement plant at Monolith, Calif. Mayor Rose signed the papers. During the leasing period the county is to pay the city \$27,500 a year. During the first year the county authorities reserve the right to elect to purchase the plant outright, agreeing to bid at least \$550,000 for it.

Supervisor Norton said: "There is no doubt in my mind that the county will purchase the plant. We have a chance already to sell 90,000 barrels of cement in Kern County at about \$1.75 a barrel and will start right in, operating."

MASON CITY CEMENT PLANTS

The Northwestern Portland Cement plant, Mason City, Iowa, will be enlarged with a new storage building to cost \$50,000. Work has already commenced on the building and it is the purpose of the company to have it completed by September 1. Both the Northwestern and Lehigh cement plants and the nine brick and tile plants of this city have been running since early spring at full capacity, and the demands for cement and brick and tile were never greater.

CEMENT PLANT MAKES RECORD RUN

A new record of production was set recently in the Alpena, Mich., plant of the Huron-Portland Cement Company when 5,008 barrels of cement were turned out in one day. The previous record was 4,876 barrels, which were made in one day in 1914. The new record was made without additional help and the employees of the plant are mighty proud of their achievement.

Orders for cement are being received daily and the outlook is for one of the busiest seasons in the history of the plant.

BATES VALVE BAG MACHINE

At a meeting of the stockholders of the Carbon Limestone Company, held recently in New Castle, Pa., contract was let to the Urschel Bates Valve Bag Company for a bagging machine which is to be used in the bagging of the product of the pulverized limestone, for agricultural purposes, a department recently established by the company.

In its operation the machine in automatic operation after bags being filled with the pulverized product, ties and seals the bags and they are then carried on a conveyor to the cars and placed for shipment.

The new machine is declared to be one of the greatest of labor devices of modern invention and its use by the Carbon Limestone Company is expected to produce wonderful profit saving results.

STANDARD CEMENT COMPANY

All records are reported to have been broken in May on shipments by the Standard Portland Cement Company of Birmingham, Ala. Shipments are said to be greater than for any month since starting in business eight years ago, and for the first five months of 1915 shipments are 50 per cent ahead of any similar period since this company commenced business.

WANTS TO REPRESENT AMERICAN CEMENT COMPANY IN ARGENTINA

Arturo Ehrenhaus, 874, Calle Maipu, Buenos Aires, Argentina, writes us he would like to get in touch with manufacturers of cement in the United States with a view to selling their product in Argentina. He has been representing a Belgian cement company for many years..

HYDRATED LIME

The daily shipments of the Lowell M. Palmer lime plant at York, Pa., according to William Bupp, the general superintendent, are now from 20 to 30 carloads. The plant, the capacity of which is about 250 tons of lime per day, is operating day and night. A large portion of the daily shipments is composed of hydrated lime, used as a fertilizer, which is sent to various dealers throughout the United States. It is stated that by far the greater portion of the shipments are consigned to Pennsylvania and Maryland farmers, who are now almost exclusively using this lime as a fertilizer. Besides the hydrated lime, the plant daily turns out great quantities of several grades of building lime, as well as crushed stone.

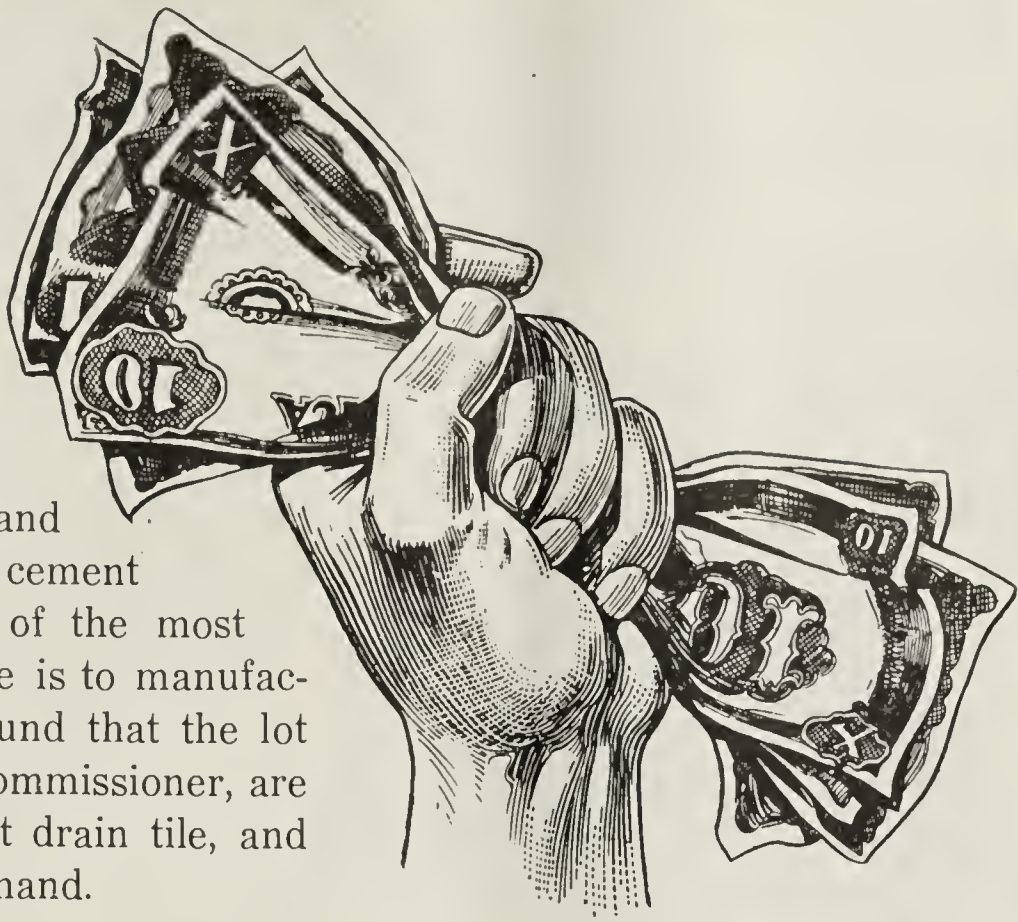
ASSOCIATED CEMENT COMPANY

E. T. King of the Bucyrus Steam Shovel Company has recently completed the erection and test of a new Bucyrus 25-B electric revolving shovel for the Associated Cement Company, Bamberton, B. C. This shovel is now in operation in their quarry.

An Opportunity

for Concrete Workers, Dealers and Sand and Gravel Producers:

MANY building material dealers, sand and gravel producers and other cement workers have discovered that one of the most profitable investments they could make is to manufacture concrete drain tile. They have found that the lot owner and the farmer, and the county commissioner, are all live prospects for the use of cement drain tile, and that there is a constant and steady demand.



Why Don't You Manufacture Drain Tile?

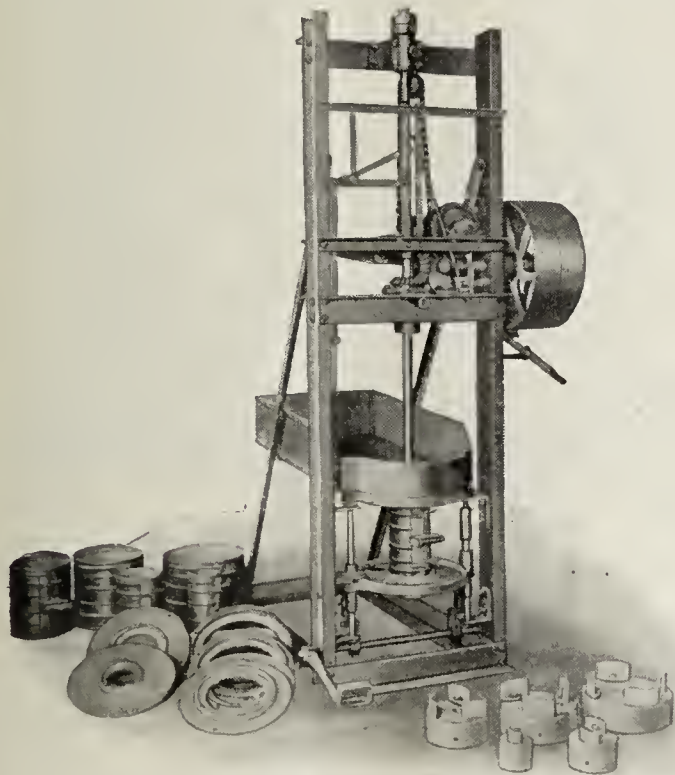
The result will be increased profits and repeat orders. The local man who is manufacturing concrete drain tile for consumption in his territory is sure to reap a rich harvest.

The Richmond Power Drain Tile Machine

is the machine that will meet your every requirement. It is the result of ten years of study and experiment to produce the highest possible capacity at a small amount of maintenance and labor cost. And the price is within the reach of all.

SENT ON 15 DAYS FREE TRIAL

If you desire to increase your business and your profit you should write today and obtain complete information on this wonderful opportunity. Learn more about our guarantee and free trial offer, and how we stand always behind you with co-operative plans to boost your sales.



Our Co-Operation Plan That Starts The Dollars Rolling Into Your Pocket

We start your business off with a rush by a direct advertising campaign at our own expense. We get your customers for you, and once a farmer has used Richmond made tile, he is always a customer and a booster for you. The information about the wonderful possibilities of cement tile business, complete description of the Richmond machine and its wonderful capacity, the process of making the highest grade of drain tile at the lowest manufacturing cost on the smallest investment and all about our co-operative sales plan is found in our catalog.

WRITE FOR ONE TODAY

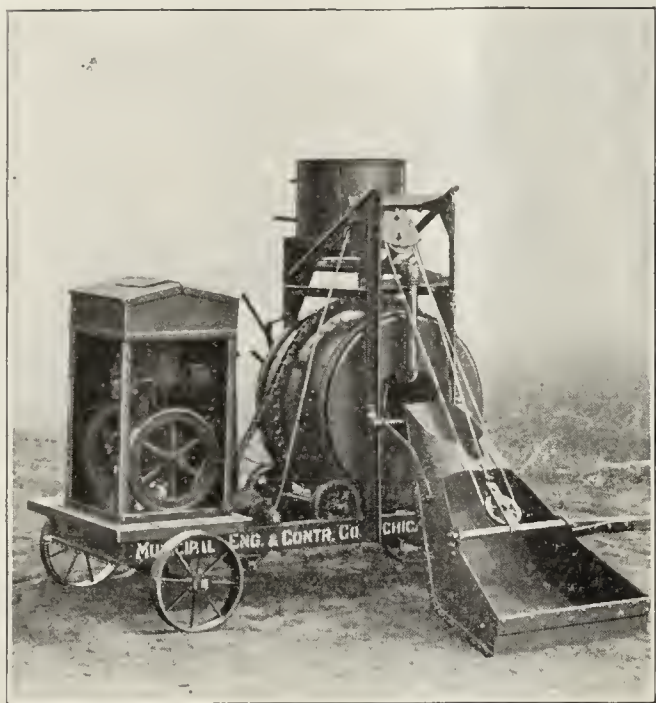
FARMERS CEMENT TILE MACHINE CO.

Box 330

ST. JOHNS, MICHIGAN.

There Is Nothing Cheap About the Austin Drum Mixer Except the Price

\$325



Just think of it, \$325 for a batch mixer that will mix a 1-2-4 mix, and one that's operated by a $3\frac{1}{4}$ H. P. gasoline engine, friction clutch, with engine covered with steel housing; equipped with charging elevator and water tank, with elevating and discharge levers operated from discharge side of machine.

The Austin-Drum Mixer is made by the same workmen and in the same factory as the Austin Cube Mixer—the machine that mixed all the concrete used on the Panama Canal.

You take no chances when you buy an Austin Drum Mixer, because for one thing, you know that it is made by one of the oldest and most reliable manufacturers in the country.

Mixes $6\frac{1}{2}$ cu. ft. of Loose Material

The mere fact that we are making this mixer should in itself be a guarantee of its high quality, workmanship and reliability. It can be depended upon to do what is required of the best mixer on the market.

Regardless of whether or not you are in the market for a mixer, you should know all about this new mixer and should

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Main Office:
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(AGENTS WANTED IN OPEN TERRITORY.)



Why Unload Material by Hand

at a Cost of 15c to 20c a Yard?

When You Can Unload Material from Cars to Trucks with an Eclipse Unloader
at a Cost of 2c a Yard

The Eclipse Portable Stone Unloader does this by unloading your Crushed Stone, Gravel, Sand, Slag, Coal, etc., from Hopper Bottom Cars to wagons at the rate of 10 Cars per 10 hour day.

Your wagons or trucks are loaded in $\frac{1}{2}$ minute instead of $\frac{1}{2}$ hour—by one man instead of 10 or more shovelers. No delays, no waiting for loads—your drivers and hauling equipment are kept busy all the time.

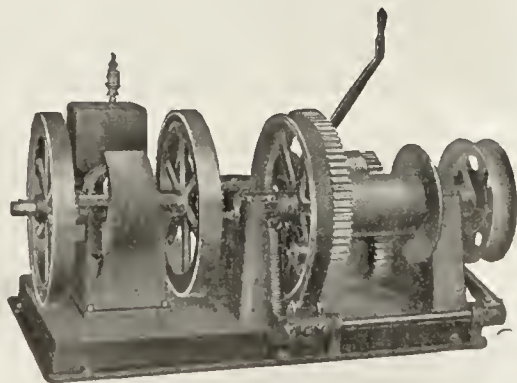
The Eclipse Portable Stone Unloader is saving contractors thousands of dollars annually. Go over your cost records and figure how much money an unloading cost of 2c a yard would save you—then write for all the facts.

THE GALION IRON WORKS & MFG. CO.

Home Office & Works, Galion, Ohio

BRANCH OFFICES: New York, Harrisburg, Enid, Okla., Richmond, Atlanta, Durham, N. C.,
Moberly, Mo., Philadelphia, Pittsburgh, Chicago, Baltimore, Milwaukee, Memphis, Des Moines.

BUILDERS' HOISTS and MATERIAL ELEVATORS



Hoist and Engine complete, direct connected,
three sizes, 5, 6 and 8 H.P.

Every up-to-date builder and contractor should post himself on the most economical way to elevate building material. We have prepared an interesting booklet on

HOISTS and ELEVATORS

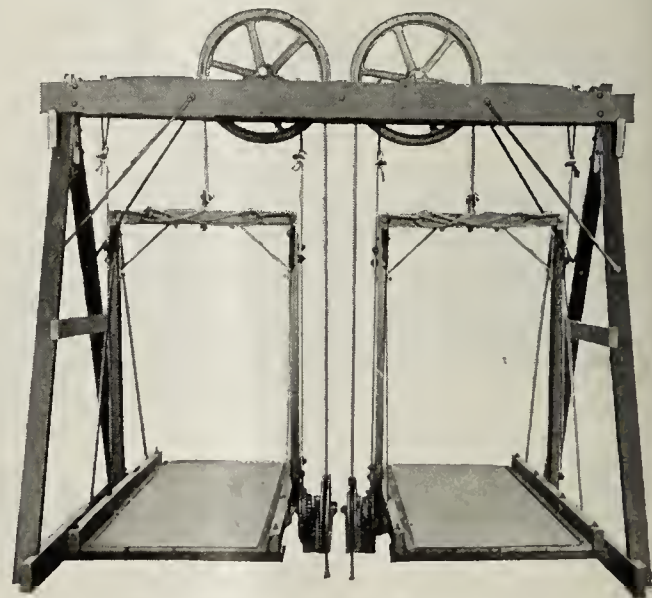
which we will send to anyone interested.

Write for it.

Bates & Edmonds Motor Co.

114 Hill Street

Lansing, Mich., U. S. A.



Double Platform Elevator for any Elevation



SAVE \$100—WHY NOT?

"The Quality Mixer at the Right Price"



The Bottom Knocked
Out of High Mixer Prices

Buy the
Republic "Six"
at
Your Own Price

When quality and price meet you get an investment worth while
See Catalog showing

**LOW CHARGING HOPPER
BATCH HOPPER
POWER LOADER
HOISTING ATTACHMENT
SPOUTING ATTACHMENT**

**\$100
TO
\$295**

The strongest and best built mixer of this class on the market. Put it in use anywhere. Haul it over the roughest roads. Put it up against any mixer regardless of price for quickness and thoroughness of mix and if you don't find it a bigger, better mixer in every sense of the word, send it back and we will refund your money.

Guaranteed REPUBLIC "SIX" Insured

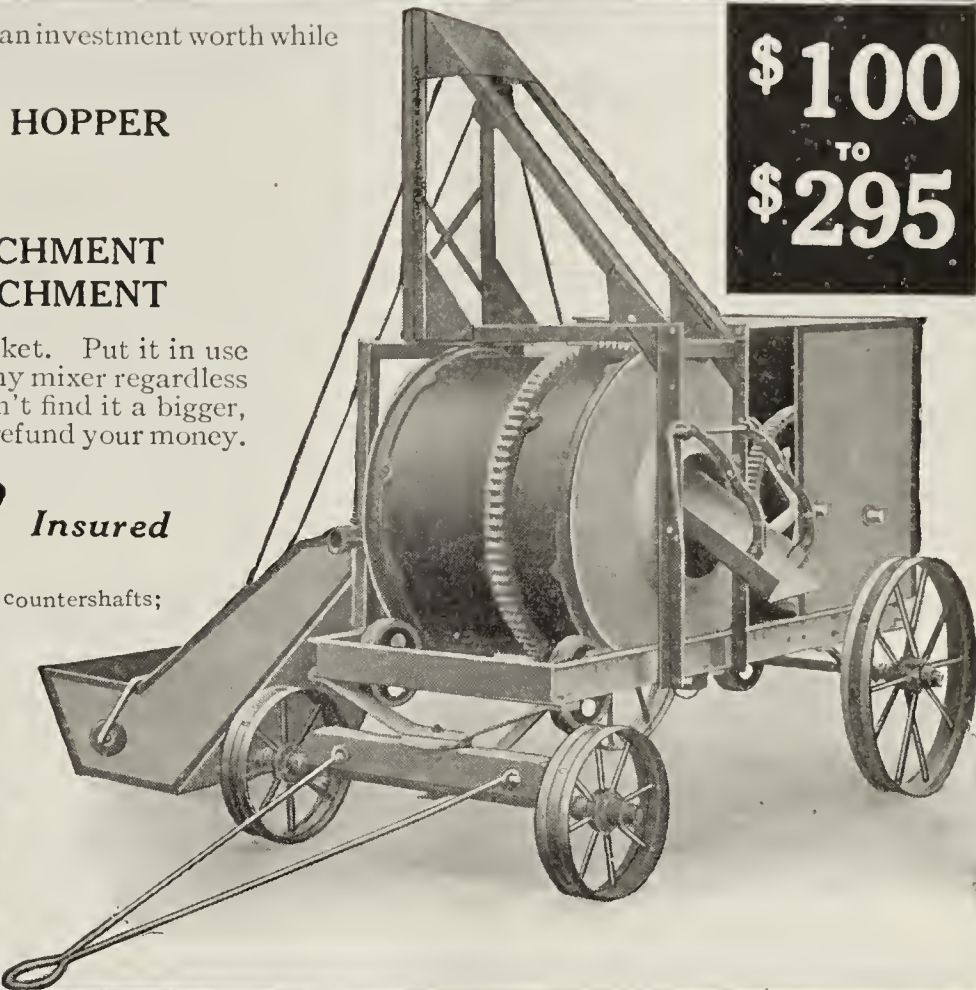
Notice this high grade construction—5-inch steel channel frame; steel countershafts; steel gears; frost and dust proof engine; 30-inch x 4-inch rear wheels; gearless power loader; light weight; low charging hopper; a 30-second mixing drum—everything like the \$2,000 pavers.

You can't go wrong on this mixer. Write today, before you forget and let us tell you in how many ways the REPUBLIC "SIX" will make and save money for you.

THE REPUBLIC IRON WORKS

LANSING, MICH.

PITTSBURGH, PA.



Our Molds and Construction Patented

USE PEERLESS SILO AND PEERLESS WALL MOLDS

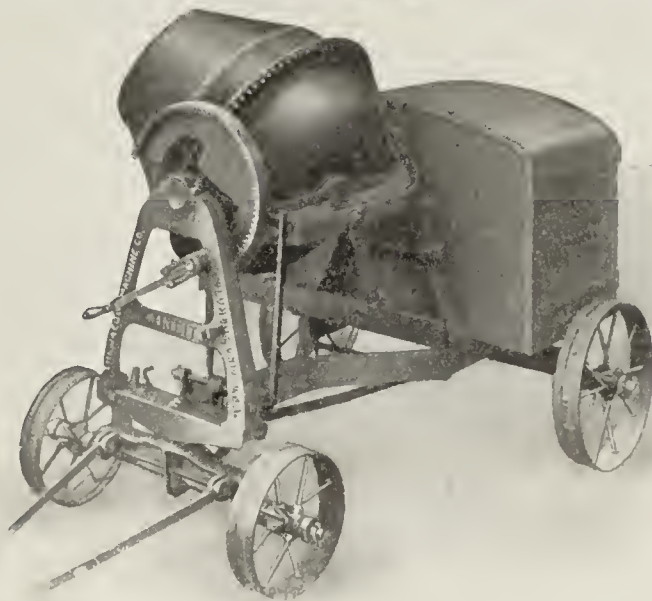
Peerless Silo Molds are the largest daily capacity molds on the market, building 7½ ft. daily, including chute, with same labor and cost as others build 4 to 6 ft. This means 3 to 5 days labor expense and time saved on every silo. It means one extra silo every month, the profits from which will PAY for a Peerless Mold in one season. THINK THIS OVER, and write for Peerless particulars.

Use Peerless Wall Molds and stop wasting lumber. Barns as well as others should be of concrete. HERE IS TO THE ALL CONCRETE FARM BUILDINGS. Ask us about them.

New Enterprise Concrete Machinery Company
68 W. Monroe Street Chicago, Ill.

STOP! LOOK! LISTEN!

Just the Mixer You've Been Wishing for
THE BIG-AN-LITTLE



Just a little bit better than the one you thought was best

1915 Model NOW READY

The small mixer has proved its worth. Contractors see that it pays better to have one or more small portable mixers than to mix by hand or to have a great big clumsy mixer. The question has been to get a DEPENDABLE Small Mixer at a low price.

The Big-an-Little is the biggest and best small mixer on earth, and our low prices amaze the mixer world.

Your neighbor has one. They are used everywhere. Ask him.

Write us

The Jaeger Machine Co.

212 W. Rich Street

Columbus, Ohio

SLAG from blast furnaces for Concrete

Blast-furnace slag used as an aggregate in concrete represents economy, safety and strength

For many reasons, blast-furnace slag is an ideal concrete material—its alkaline nature, tending to prevent rust in reinforced concrete—its light weight, enabling it, in floor slabs for instance, to support a given live load with smaller dead load on supporting frame—its contents of silica, alumina and iron, which increases the permanency of any concrete of which it is a part—its fire-resisting qualities—these are some of the features which have impelled the most careful engineers and architects to specify slag in place of other concrete aggregates.

The high crushing strength of slag-concrete has been demonstrated in various tests made of unprejudiced parties in nearly every large city. Slag-concrete has always developed strength uniformly higher than gravel-concrete or limestone-concrete.

Engineers and Architects

Blast-furnace slag as a concrete material is better understood than it used to be. Before you write your concrete specifications, get in touch with any of the following competing producers of blast-furnace slag—let them submit the results of long-time tests of slag-concrete.

Birmingham Slag Co.
1001 Woodward Building
Birmingham, Ala.

The Sommerfield Co., Inc.
1863 61st Street
Brooklyn, N. Y.

The France Co.
Second National Bank Bldg.
Toledo, Ohio



The Commonwealth Power Co. tunnel under Grand Ave., Milwaukee, Wis., recently successfully waterproofed with

“Hydrite”

COLORLESS WATERPROOFING

Hourly Leakage 5200 Gallons STOPPED! 700 ft. Concrete Tunnel 55 feet below datum was made watertight.

The success of our method eliminated the necessity of pumps and SAVED \$80.00 to \$100.00 PER MONTH.

In addition to the possibility of damage to the cables, etc., from the seepage. This tunnel, 10 years old, has been free from leakage for nine months, or since work was completed. We guarantee it to stay so.

HAVE YOU A WATERPROOFING PROBLEM?

Difficult waterproofing problems in NEW or OLD work can be economically and successfully solved. The experience of a successful organization is at your service and satisfactory results are guaranteed.

Our method of applying grout, internally or externally, under heavy pressure through pipes, or upon the surface, as the conditions require, is applicable to tunnels, reservoirs, foundations, basements, etc., of masonry or concrete construction. Leaks are not only stopped but the structures are strengthened.

Let us help you with your waterproofing problem. Write us concerning our product and methods. Ask for descriptive booklet.

WATERPROOFING COMPANY OF AMERICA
MILWAUKEE, WIS.

Branch Offices:
543 McCormick Building, Chicago. Callahan Bank Building, Dayton, Ohio.
1014 Transportation Building, Montreal, Canada.



SIDEWALK FORMS

CURB AND GUTTER FORMS

The contractor who bids on sidewalks, curbs, curb and gutters with the idea of using wooden forms is generally bidding under a definite handicap and will always do the work with less profit than he could with steel forms.

HELTZEL steel forms represent the very latest designs and their use means better work and better profits. Spread over the work of a season or two they mean a lower form cost per running foot of sidewalk than the use of wood forms. They are easily assembled. Work is fine, accurate and even. Write today for Free Catalog.

Heltzel Steel Form & Iron Works
Niles Road, Warren, Ohio

THE LOW DOWN FORCE FEED MIXER



has a capacity of from 4 to 12 cu. yards an hour with a forced feed and stroke off measurement different from all others. It gives absolutely perfect proportions whether the materials are wet or dry. Cannot clog. You can set and lock the feed gates so there will be no variation.

Few parts, open-to-view mechanism and low down hoppers make this mixer economical in operation and upkeep. Feed can be changed without stopping the machine. Safety friction clutch enables you to stop or start the machine without stopping the engine. Construction perfect. Price remarkably low.

Find out more of the Low Down's good features. Send for Catalog "B," which gives detailed information. Mention Cement & Engineering News when writing.

ELITE MFG. CO., Ashland, Ohio

The HARDING MORTAR MIXER Successfully Mixes Hard Wall Plaster and Brick Mortar

The sensation of the Chicago and Omaha Cement Shows was the rapid, successful and thorough mixing of hard wall plaster with hair and fibre, lime mortar and Portland cement with the Harding Mortar Mixer. We mixed the actual material for the "show me" type of contractor, and made good with him.

With this Mixer you save the wages of one to six laborers on every job. One laborer can do the work of four; two men can do the work of eight.

You save one-quarter of your material bill. Thorough mixing permits use of more sand.

You get perfect mortar, impossible to get mixing by hand. Machine mixed mortar is uniform. It spreads easier, hangs together better and sets harder.

You make a good mortar man out of any laborer.

You have Mortar all the time, and exact amount to last you until quitting time. The machine is fast. A batch can be dropped out in ten times the time the material could be mixed in the box. Write us for proof from Contractors and details now. Sold on Free Trial.

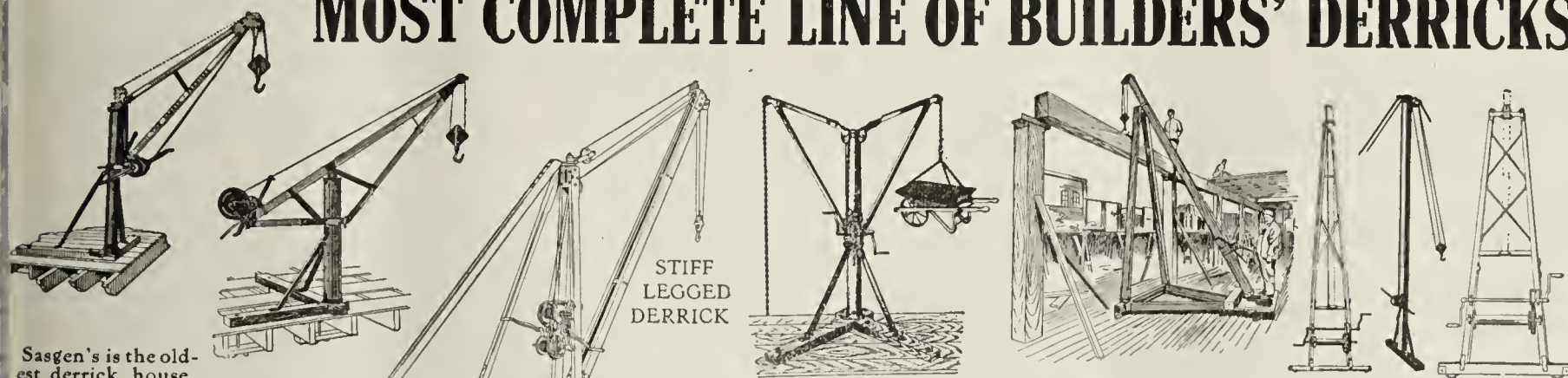
Architects are beginning to specify machine mixed mortar. An exceptional proposition for representatives in unoccupied territory.

The Mortar Mixer Corporation

700 Washington St.,

Iowa City, Iowa

MOST COMPLETE LINE OF BUILDERS' DERRICKS



Sasgen's is the oldest derrick house in the country. We make the strongest, best and most reasonable price derricks.

We manufacture Steel and Wood Circle Swing Builders' Derricks, hand and power. Pole Setter, "A" Frame, Double Boom Wheelbarrows, Stiff Legged and Guy Line Derricks Single and Double Drum Geared Winches, Blocks, etc.

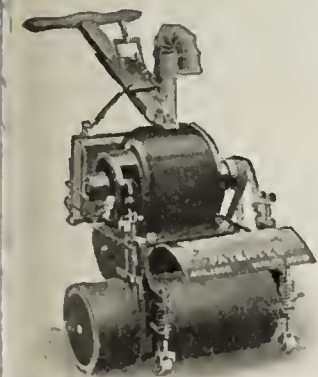
SASGEN DERRICK COMPANY,

2052 North Racine Avenue, CHICAGO

WRITE FOR CATALOG No. 15

TEST AND TRY BEFORE YOU BUY

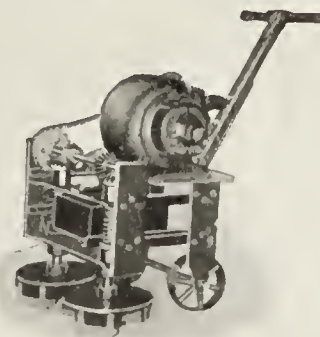
The Schlueter Rapid Floor Surfacer



The Schlueter BALL BEARING electric floor surfacing machines for mosaic, marble, composition and wood floors are the most simple constructed machines on the market. Direct chain drive AUTOMATIC DUST COLLECTORS. No gears or clutches to wear. Made in various styles.

OVER 5,000 IN USE ALL OVER THE WORLD

Send for prices and free trial proposition



THE M. L. SCHLUETER CO.

225 W. Illinois Street, CHICAGO

GET THE LANSING HABIT

Contractors Are Finding It Not Only a Difficult One to Overcome, But a Profitable One to Form.

We Are Headquarters
For Everything in
The Concrete Line



These 1915 Model Lansing Mixers

are making great records for low concrete costs and troubleless operation.

HERE IS OFFERED

Sturdy Construction—LONG LIFE—LOW OPERATING COST—STEEL CUT GEARS; machined track and trunion rollers; heavy steel channel frame; high, wide wheels; low charging hoppers; powerful engines; friction clutch like an automobile; batch hoppers or side loaders.

Tell Us What You Need and We Will Tell You What It Costs. Ask for Catalog No. 354

LANSING COMPANY

LANSING, MICHIGAN, U. S. A.

or address our nearest warehouse.
We carry stocks at the following:

Southern Factory—Parkin, Arkansas.
Boston—78 Cambridge St. Charlestown District.
Chicago—169 West Lake Street.
Kansas City—1413-1415 West Tenth Street.
Philadelphia—Willow and No. American Streets.
New York—285-289 West Street.
Minneapolis—330-334 First Street, North.
San Francisco—338-348 Brannan Street.



Silo Roof Facts

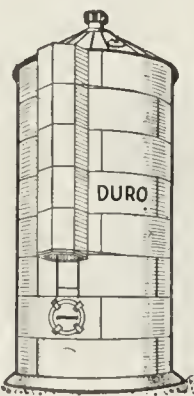
THAYER'S Self-Supporting Opening Silo Roof has solved the silo problem for silo owners. Adds 25 per cent capacity to a 24 foot silo. A 12 section metal Roof attached to 24 Rafters that OPEN OUT leaving Top of Silo open and FREE from cross-pieces, post or braces.

As all Our Roofs are Erected from the Inside of Silo, the Same Platform that is Used In Building Silo can be Used to place Roof on Silo. Our Patent Rafter-Irons are the HANDIEST, STRONGEST and Easiest way to FASTEN a Silo Roof to a Cement Silo known of. Fastened with set screw bolts. For Sale by Silo Contractors, Silo Mfg., Silo Agents, or direct to you where we have no agents.

Agents Wanted. Write for catalog and prices.

H. M. THAYER CO., Woodhull, Illinois

"DURO" METAL Tops—Doors—Frames and



Forms for Erecting
Concrete Silos and Tanks
PURE IRON GALVANIZED

will last as long as the silo.
Write for prices. Manufactured
only by

**C. C. Fouts Co., 220 Canal St.
Middletown, Ohio**

The Perfection Concrete Stave Silo

made by the "wet mix" system.

The staves are so formed that any diameter of silo can be built. The staves are made by the "wet mix" system by casting them in our steel moulds. The product is a strong, non-porous, water proof stave, made with common labor and right at the "silo job." No factory required; you save railroad freight, loading and breakage of staves.

Our "All-Steel Door-System"

is ideal and just what the silo feeder demands. Doors continuous from bottom to top of silo; size 24x25 inches in the clear.

Concrete Workers

get into the Concrete Stave Silo business. It is a growing and permanent business, and our system makes you big Profits.

Get the best form of construction—one that can not be out classed later.

Get the "Perfection."

Write us to-day for our liberal proposition to supply you with our steel moulds and exclusive territory. Let us give you facts and figures on ease of erection, permanency of construction and low cost and big,

Profits

to you. You will be highly interested. Write to-day.

Perfection Concrete Stave Silo Co.

506 Clapp Building

DES MOINES, IOWA

CAREY

Elastite

NAME U.S. Patent Office.
EXPANSION
JOINT
"The Sandwich Joint"

Used to take care of expansion and contraction in concrete roads and streets.

Thousands of feet installed during 1914. We will gladly tell you where.

Write for sample and literature.

"Remember We Are the Pioneers"

THE PHILIP CAREY COMPANY

23 Wayne Ave. Lockland, Cincinnati, O.

THE "ALL PURPOSE" MIXER

ONE
SACK
SIZE

SOLD AT
AN
ASTONISH-
INGLY LOW
PRICE

TRACTION
IF
DESIRED



DISCHARGES
DIRECTLY
INTO FORMS
or BARROWS

PAVES ALLEYS
and CARTRACKS

FASTEST SIDEWALK and
CURB MIXER EVER BUILT

"LIGHT WEIGHT"
BOSS
BUILT OF STEEL

HALF A TON LIGHTER-
30% STRONGER THAN
CAST IRON MIXERS.

BOSS MIXERS LEAD IN LABOR SAVING DEVICES AND
MODERN IMPROVEMENTS

HYATT ROLLER BEARINGS (Oil once a week)

AUTOMATIC STOP POWER
LOADER

"RE-MIX" mixing action. Auto-
matic water tanks. Novo or
Ideal engines (or steam)

6-8-12 ft. sizes.

Equipped as you like.

Cash or Payments.

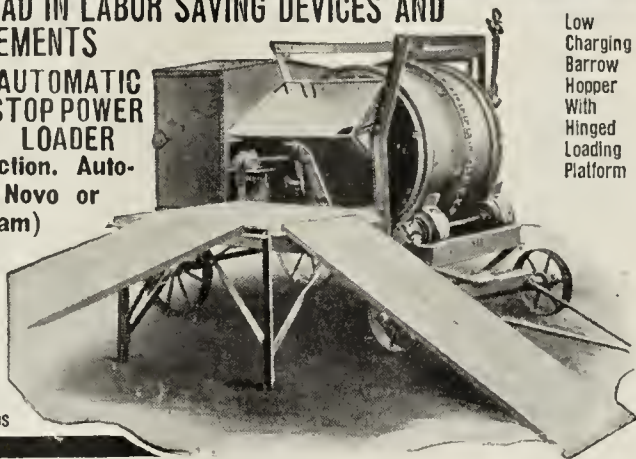
American Cement

Machine Co., Inc.,

9635 JOHNSON ST.

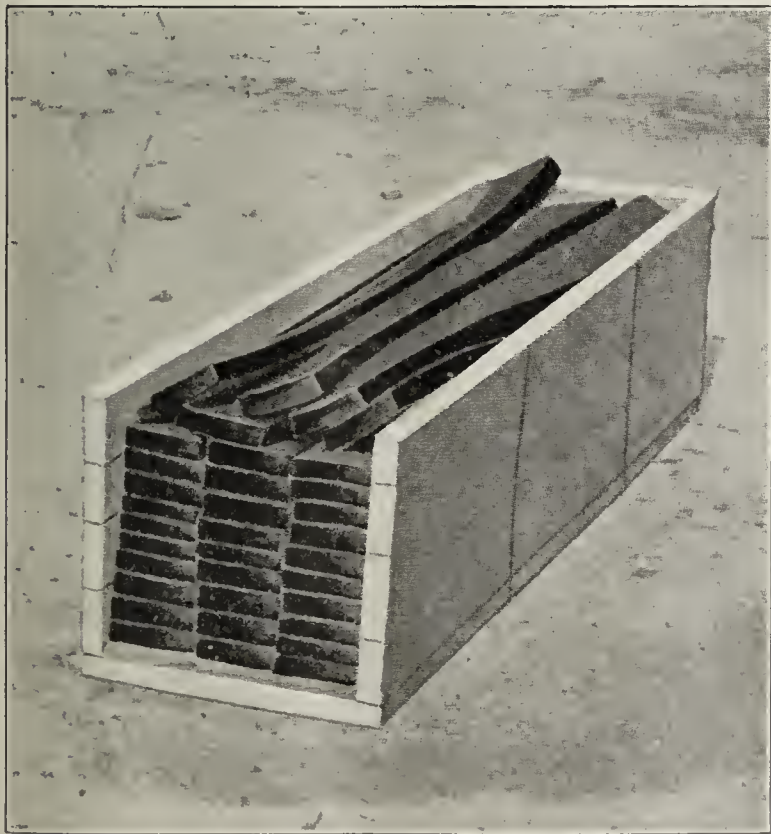
KEOKUK IOWA

Stock carried in all large cities



Low
Charging
Barrow
Hopper
With
Hinged
Loading
Platform

Genasco Expansion Joints



have all the advantages of other prepared joints for concrete, wood-block, brick and granite-block pavements—economy, ease of installation, the avoiding of melting and pouring—and besides this

Are All Asphalt

The entire thickness of a Genasco joint serves the purposes of expansion and contraction. Ready-made joints that contain felt or some other form of re-enforcement cannot do the work of the Genasco all-asphalt joint. Any thickness or depth.

The best way to judge this joint is to see it. A life-sized sample will be sent to any one interested. Write for it today.

THE BARBER ASPHALT PAVING COMPANY
Philadelphia, Penna.

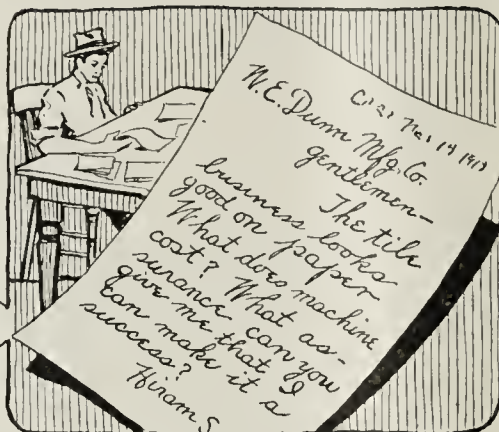


1
HIRAM SMART IS A CONTRACTOR MAKING CONCRETE PRODUCTS. HE IS LOCATED IN A FARMING COMMUNITY AND WHILE MAKING A COMFORTABLE LIVING, HAS THE AMBITION FOR A BIGGER BUSINESS.

2
AN ADVERTISEMENT IN A TRADE JOURNAL DESCRIBES THE POSSIBILITIES OF THE CEMENT DRAIN TILE BUSINESS WHILE HIRAM DOESN'T BELIEVE IT, HE INVESTIGATES OUT OF CURIOSITY.



THE CATALOGS AND LITERATURE GIVE COSTS AND SELLING PRICES AND SHOW THAT ALTHOUGH CEMENT TILE IS FAR SUPERIOR TO CLAY, IT CAN BE MADE CHEAPER AND WILL PAY A BIGGER PROFIT.



HIRAM GETS ENTHUSIASTIC BUT IS IN DOUBT ON TWO POINTS. 1-WHETHER HE HAS SUFFICIENT CAPITAL TO START ON. 2-WHETHER HE COULD BE SUCCESSFUL IN HIS LOCALITY. HE INVESTIGATES FURTHER.



5
THE REPLY SHOWS THAT HIRAM CAN START ON AN INVESTMENT OF A FEW HUNDRED DOLLARS, AND THAT HE CAN PROVE WHETHER OR NOT THE BUSINESS WILL BE SUCCESSFUL BY USING THE EQUIPMENT 15 DAYS BEFORE DECIDING TO BUY.

6
HIRAM ACCEPTS THIS OFFER, THE MACHINE COMES AND IS PUT TO WORK; HIRAM IS SURPRISED BY ITS SIMPLICITY OF OPERATION AND BY THE HIGH QUALITY OF TILE IT MAKES.



HIRAM FIGURES UP HIS COSTS. HE FINDS THAT 3 MEN CAN MAKE 1,600 TILE DAILY AT A TOTAL COST OF \$28.15; BY SELLING THEM AT THE SAME PRICE AS CLAY TILE, HE CAN CLEAR \$19.85 PER DAY.



HE IS CONVINCED OF HIS ABILITY TO MAKE TILE, AND AT A GOOD PROFIT, AND NOW HE TRIES THEIR SELLING QUALITIES. HE ARRANGES A DISPLAY WHERE PEOPLE CAN SEE THEM, AND CIRCULARIZES THE FARMERS IN HIS LOCALITY.

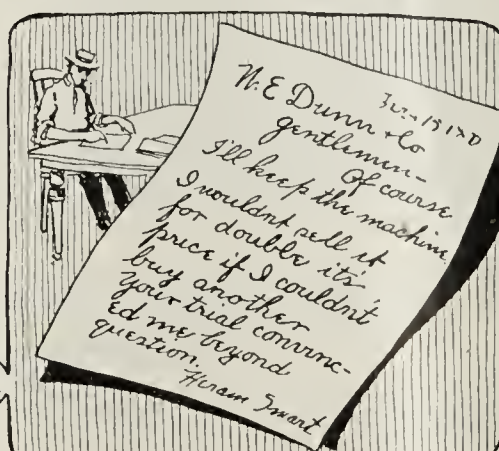


9
THE FARMERS HAVE NEVER LIKED CLAY TILE, AND ARE QUICK TO INVESTIGATE HIRAM'S CEMENT TILE "BEST WE HAVE EVER SEEN" THEY EXCLAIM "CEMENT TILE FOR US IN FUTURE!"

10
HIRAM SHOWS HIS TILE TO LOCAL DEALERS, AND CONVINCES THEM THEY CAN MAKE MORE PROFIT SELLING HIS TILE THAN THEY CAN SELLING CLAY TILE, BESIDES GIVING THEIR CUSTOMERS MORE SATISFACTION, THEY GIVE HIM GOOD ENCOURAGEMENT.



AT THE END OF THE 15-DAY TRIAL PERIOD HIRAM IS ASSURED OF SUFFICIENT ORDERS TO KEEP THE MACHINE RUNNING FOR THREE MONTHS, WITH AN APPROXIMATE PROFIT OF \$1,548.30



HIS LETTER TO THE W.E. DUNN MFG. CO. SHOWS HE IS IN THE TILE BUSINESS FOR GOOD. HIS EXPERIENCE IS TYPICAL OF THE SUCCESS THAT HUNDREDS OF OTHERS ARE GETTING AND WHAT HUNDREDS CAN



The Reason Why You Are Not Making Cement Drain Tile Is Because You Have Not Yet Investigated Its Possibilities

The superiority of cement tile for drainage purposes is known; there is no competition in quality or price. For this reason its future use is assured, as well as its present use.

The cement drain tile business does not require a large investment—nor skilled labor—nor hard selling. A few hundred dollars will start you right; you can use unskilled labor; you can sell all the tile you manufacture without any difficulty.

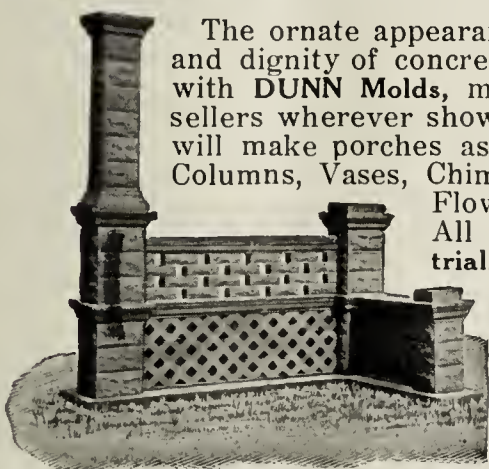
And we are prepared to guarantee profits ranging from \$230 to \$800 a month.

Ask us today for printed proof of comparative costs and profits in making tile; we send this information free upon request.

Dunn equipment is sold on 15 days' trial; write for the tile equipment catalog. Price of Dunn No. 1 Tile Machine.....

\$165

Concrete Porches Pay a Bigger Profit Than You Think.



The ornate appearance, permanence and dignity of concrete porches made with DUNN Molds, make them ready sellers wherever shown. Dunn Molds will make porches as illustrated, also Columns, Vases, Chimneys, Balusters; Flower Boxes, etc. All sold on 15 days' trial.

Write for Porch Mold catalog today. Price of outfit for making porch as shown,

\$39



Don't Tamp Sewer Pipe—POUR IT!

Tamping a semi-dry mixture, to make large drain tile and sewer pipe, is not only slow, troublesome and costly—but unnecessary. Pouring a wet mixture into DUNN Molds, besides being the most efficient method, assures the strongest product. Reduces manufacturing costs, too, and increases the profits.

Dunn Molds permit the manufacture of all size pipe, from 6 to 36 inches in diameter. All sold on 15 days' trial: Pipe Mold catalog gives full descriptions and prices, ask for a copy. Price of 12-inch mold.....

\$7.50



Pat's No. 842262 and 782700

Here's Mixer Value Out of the Ordinary

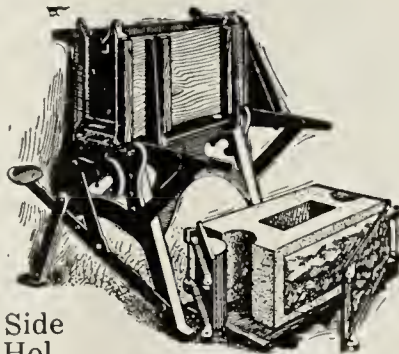
Let facts—not claims—influence your buying judgment. You buy concrete mixers because of what they are, not because of what they are claimed to be. To learn about the Dunn construction is to learn the reasons why a DUNN Mixer is the mixer you have waited for.

Dunn Mixers have four mixing blades and extra long drums, giving them the highest possible mixing efficiency. The convenient loading height and the power discharge feature, save labor. Their capacity—a batch a minute—is assurance of ample speed. The one-piece hollow yoke makes the operation almost noiseless. The all steel and iron construction is evidence of long life.

Write today for catalog describing all styles and sizes. We sell on 15 days' trial. Prices.....

\$67.50 to \$224

Use Three Block Machines—but Buy only ONE



To make Face Down, Side Face and Two-Piece Hollow Wall Cement Blocks usually requires three machines. But one DUNN Combination Cement Block Machine will make all three types. Saves two-thirds the usual investment.

By using a wet mixture it saves considerable tamping, and makes a stronger block. And a special off-bearing system protects each block against breakage. Capacity, 150 blocks daily.

Sold on 15 days' trial. Write for Block Machine catalog. Price.....

\$40

The Concrete Fence Posts that Sell the Quickest



Are those of high quality and moderate price. These are the kind that DUNN Fence Post Molds made. The Dunn system enables quick and economical manufacturing. Tamping is eliminated by our special Vibratory Base which compacts each post to uniform density and firmness. Made in batteries of four and ten. Sold on 15 days' trial. Price of 4-mold battery.....

\$12.50



W. E. Dunn Mfg. Co.
4139 Fillmore St., Chicago



HURST SILO

TEN YEARS AND NOT A FAILURE!

That's the Record



The largest order ever given in the U. S. for Concrete Silos. C. D. Thompson, of Trenton, Mo., places his order for 30 Hurst Silos, 18 feet in diameter and 52 feet high.

JOSEPH S. NEFF, PRESIDENT
C. D. THOMPSON, VICE PRESIDENT

BANK OF BRIMSON

CAPITAL STOCK, \$10,000.00
SURPLUS \$1,000.00

Brimson, Mo. July 31st, 1914.

The Hurst Silo & Construction Co.,
Trenton, Mo.

Gentlemen:-

In accordance with the conditions specified in your contract which I have signed and enclosed, you will please enter my order for 30 Hurst Silos, 18 ft. in diameter and 52 ft. high. Same to be completed as soon as possible on my farms in Grundy and Livingston Counties, Missouri.

I have now on my farms 3 Hurst Storage Tanks for water, 16' x 18', 8 large Hurst Drinking Tanks, and 1 Hurst Silo 18' x 52', all of which are giving perfect satisfaction and for this reason I am placing this order with you for the additional silos.

Yours very truly,
C. D. Thompson

Hurst Silos are built of reinforced concrete blocks, made in Hurst Patented Molds using the poured system—a dense block water-proof and of tremendous crushing resistance.

The Hurst System of Silo Construction will interest you. It is inexpensive and enables anyone to turn an investment into quick money. Farmers recognize the Hurst Silos as a sure and safe investment.

What The Hurst Silo & Construction Company, builders of Hurst Silos, write us will interest you. Read it: July 31st, 1914 we purchased the exclusive right to manufacture Hurst Silos and Tanks in 35 counties in Missouri and 5 in Colorado.

August 1st we commenced our factory at Trenton. August 14th we were making blocks. October 22d we had erected 15 silos with 3 more delivered ready for erection, with 4500 blocks curing in the yard.

This, in spite of the fact that we had no salesman employed and did not get started before most silo firms had discontinued business for the winter.

To take care of our business we expect to establish 6 to 10 factories in our territory, each with a capacity of one silo per day.

Our molds, having a capacity of 1 silo per day, cost us less than \$1000.

The Hurst System of reinforced concrete construction reduces to the minimum time, labor, expense and competition.

We have some more openings for live, responsible parties, but they are going fast. Don't put it off, but act now.

Write for Particulars and Catalogue

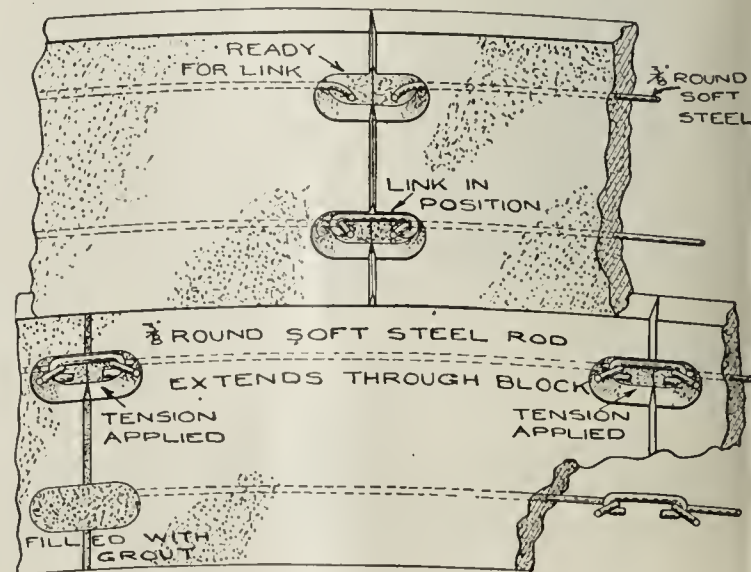
The Chas. B. Hurst Company

Established 1904

819-829 Exchange Ave.

Union Stock Yards

Chicago



The HURST Reinforced Block for Tank and Silo Constructions

W. C. POLK, PRESIDENT

H. O. CHERRY, VICE-PRESIDENT

H. T. GENUNG, SECRETARY AND TREASURER

POLK-GENUNG-POLK COMPANY

INCORPORATED

THE POLK SYSTEM

DIRECTORS

W. C. POLK, Fort Branch
H. O. CHERRY, Indianapolis
W. A. POLK, Fort Branch
H. T. GENUNG, Fort Branch
J. W. SKEAVINGTON,
Princeton

PAT. OCT. 23, 1906
PAT. OCT. 29, 1908

CAPITAL \$50,000.00

RE-ENFORCED
MONOLITHIC CONCRETE
CONSTRUCTION

FOR
GRAIN STORAGE
SMOKE STACKS
STAND PIPES
and SILOS

Mr. Concrete Contractor,
Anywhere, U. S. A.

Fort Branch, Indiana, July, 1, 1915

My dear Sir:

If your business is irregular and generally unsatisfactory, we have something that will interest you. If the competition of beginners, who bid low "to get a start," is a source of worry and loss, you need our HELP.

You owe it to your business, yourself, and your wife to investigate the concrete silo business. The best way to start is to write for FREE information on the POLK SYSTEM of circular monolithic concrete construction.

We suggest that you do this today.

With best wishes,

POLK GENUNG POLK CO.,

P. S. Ask for catalog "M."

James H. Cherry
Sec.

A New Principle Invented in Cement Stave Silo Construction A Needed Improvement. Silos, Tanks, Etc., Built Any Size Desired

Mr. S. T. Playford, the originator of cement stave silos, has purchased an absolutely new type of silo. Those who have seen it—and who have made searching comparison with Mr. Playford's earlier efforts in cement stave silos, are united in saying that this invention creates a new standard by which silos must now be judged.

This new silo will be known as the S-T-P. The S-T-P Silo embodies the latest, up-to-date knowledge and experience in silo building. Being a new silo, we are not forced to cling to old ideas, patterns and machinery. We have in the most original manner produced a silo that is strikingly different—a silo of incomparable strength and matchless durability and efficiency. The S-T-P will enable you as a contractor to offer an A-No. 1 business proposition to the farmer. The

S-T-P Silo

"SILO THAT'S PERFECT"—Invented by W. A. Hillman

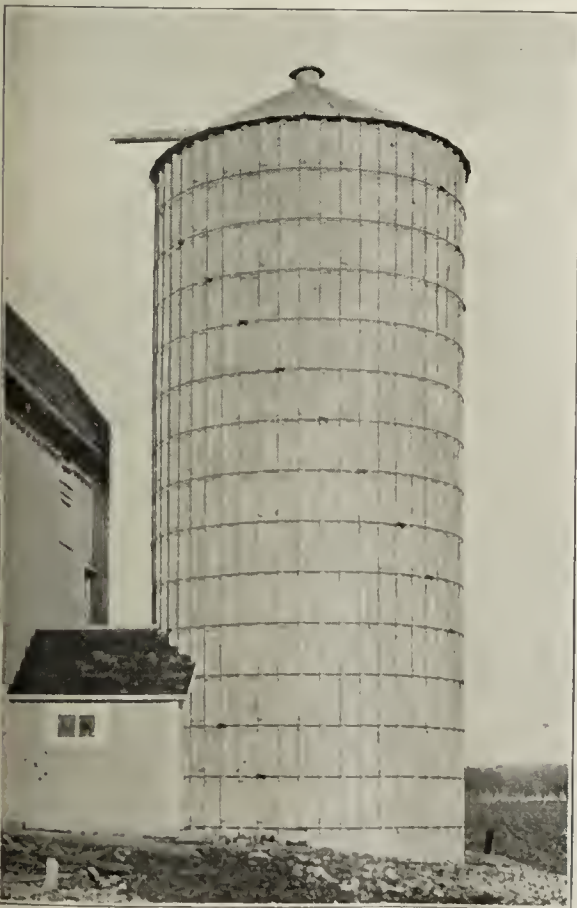
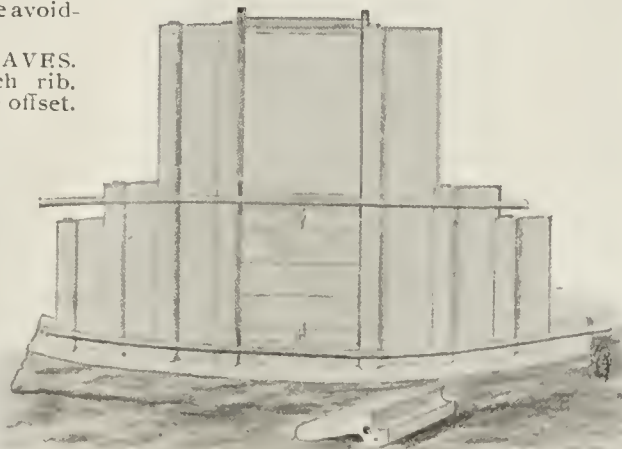
The more you know about silos, the more you will appreciate the S-T-P. The less you know about silos the more important it is that you learn about the "S-T-P." It means the avoidance of dissatisfaction and money losses.

The "S-T-P" is made of SLUSHED STAVES. Thoroughly reinforced. Has a 4½ inch rib. Pointed up on the outside. The hoops are offset. This to give a ladder to work upon.

Write for circular,
prices and further
information

**PLAYFORD
MFG. CO.**

298 Douglas Avenue
ELGIN, ILLINOIS



Minnesota Cement Construction Co., Long Prairie, Minn. Andrew Nordloef, Mgr. for Minnesota, No. and So. Dakota, Iowa Nebraska and Wisconsin

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TURN NIGHT INTO DAY**

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From 500 to 10,000 Candle Power
at a cost of less than one cent
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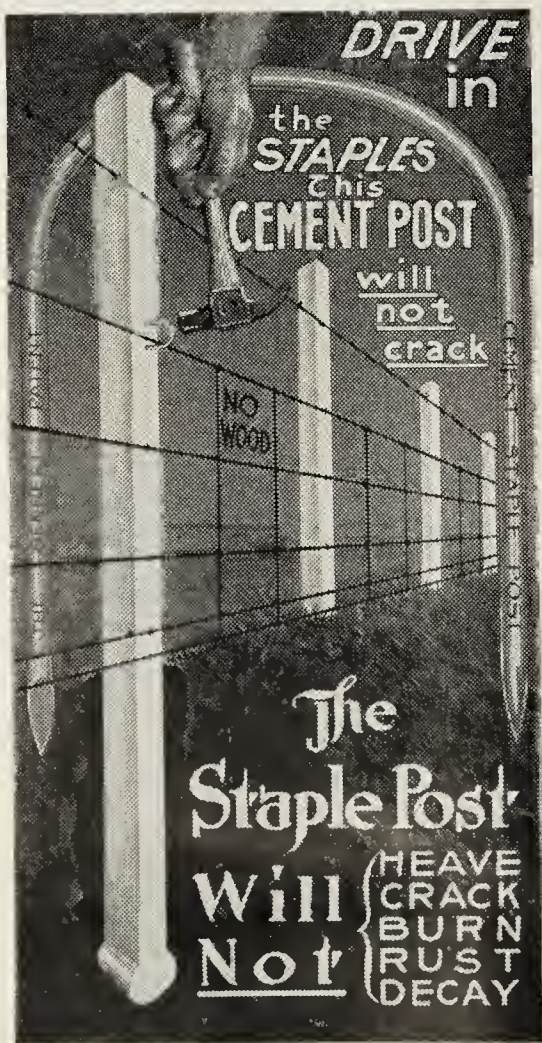
THE MACLEOD CO.

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202



Staple Post Mold Co.
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An Everlasting Cement Post

INTO WHICH

Staples Are Driven

The same as into wood. In use since 1906 and absolutely practical

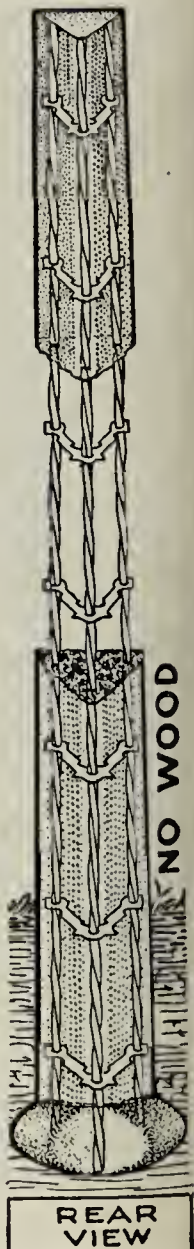
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SEE THE REINFORCEMENTS

Strongest known to Engineers—Not a single complaint of posts breaking off at ground line—Lightest, strongest, easiest to make—compete with wood posts in many places.

MAKE STAPLE POSTS

A splendid opportunity for men of business and capital
Investigate and be convinced





MEDUSA WHITE PORTLAND CEMENT

USED FOR EXTERIOR FINISH OF
ST. FRANCIS WOOD GATEWAY, SAN FRANCISCO

MEDUSA White is an indispensable material for permanency, beauty and elegance in stucco, building ornamentation, concrete building blocks, interior decoration, statuary, cemetery work, setting marble, etc., and its artistic possibilities are unlimited. It is to be used in the same manner as ordinary Portland cement from which it differs in no respect except in its pure white color.

GIVE MEDUSA WHITE A TRIAL AND BE CONVINCED OF ITS SUPERIORITY

Dont fail to write for our new booklet
of illustrations and testimonials

SANDUSKY PORTLAND CEMENT CO.
SANDUSKY, OHIO



FRENCH'S PORTLAND CEMENT

Samuel H. French & Co.
PHILADELPHIA

Established 1844

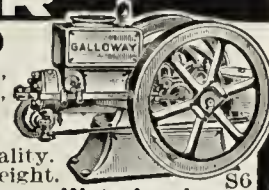
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FOR CONTRACTORS AND BUILDERS

To pump, saw, excavate, hoist, irrigate, run mixers, elevators and all heavy machinery. Can be had in Galloway engines from 1 1-2 to 16 h. p. All styles. 200,000 customers testify to quality. Prices 1/2 to 1/3 what's usually asked. Low freight.

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Long Handled
Cement Finishing
Tools
Operated
Automatically

One Man With The Double Action Cement Tools Can Do the Work of Five

in a given time with old style finishing tools—which means a **SAVING** of EIGHTY PER CENT OF THE FINISHING COST OF YOUR WORK.

All Our Finishing Tools Work Automatically

Finishing Trowel has 24-inch blade; 16-inch trowel with jointer attachment, edger and float.

BETTER WORK AT LESS COST

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ABRAM CEMENT TOOL MFG. CO.
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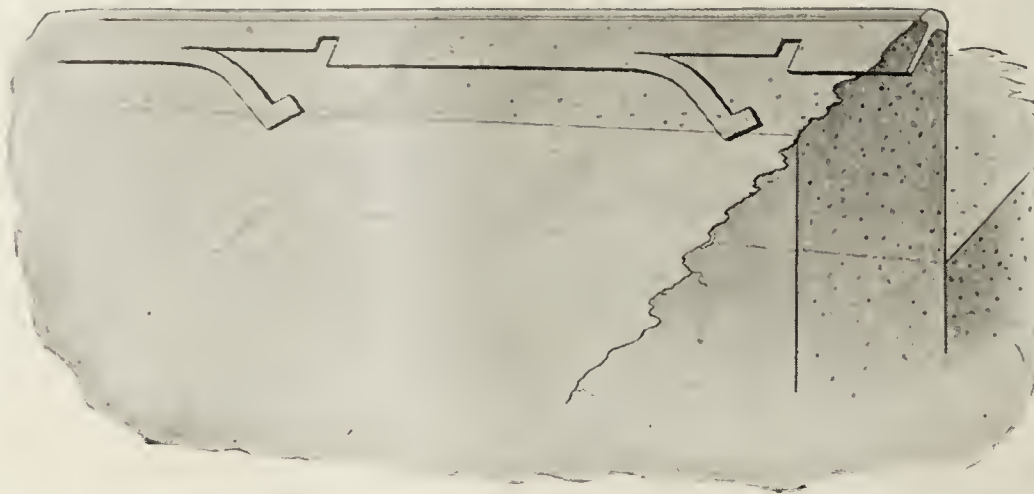
LET US SHOW YOU that there is more money in building concrete culverts over our forms, than in any other branch of your business. One form adjusts to any size from 20 inches to 48 inches in diameter, so you need but one investment for all your culvert work. We also make an arch form, adjusting from 6 to 12 feet. One of these forms will insure you all the culvert building in your vicinity at profits that will exceed any other branch of your contracting. Write at once for free catalog and special offer to contractors.

The Merillat Culvert Core Co.

Dept. G.

Winfield, Iowa

ANY EDGE PROTECTOR



which anchors itself only to the very corner it protects, certainly defeats its own purpose.

The anchors of our hook bar are parts of the bar and extend deep into the body of the concrete, thereby fastening the curbing in a most positive and powerful manner.

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Compactness and Sturdiness Mean Greater Efficiency



The "Excelsior"

was designed and built to set a fast pace for the higher priced mixers and contractors say it does. Equipped with low hopper; friction clutch; dust proof bearings; 3 H. P. engine. Can be equipped with hoist at small additional cost. Capacity $4\frac{1}{2}$ feet mixed material per batch; easily 65 cu. yds. per day. Write for illustrated catalog and judge for yourself the extra value of the EXCELSIOR.

Good territory open for agents

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AGENTS: Universal Steel Products Co., Chicago, Ill. L. & D. P. Smith, Valdosta, Ga. Loyal Power Co., Omaha, Neb. Manufacturers Supply Co., Minneapolis, Minn. Ward Equipment Co., Pittsburgh, Pa. E. W. Ripley, Farmington, Me.

BLOCK MACHINES

Face Down Handles Wet Mixture

CEMENT BRICK MACHINES

Hand Power; also Power
Brick Machine; 60,000 tamped
cement brick per day

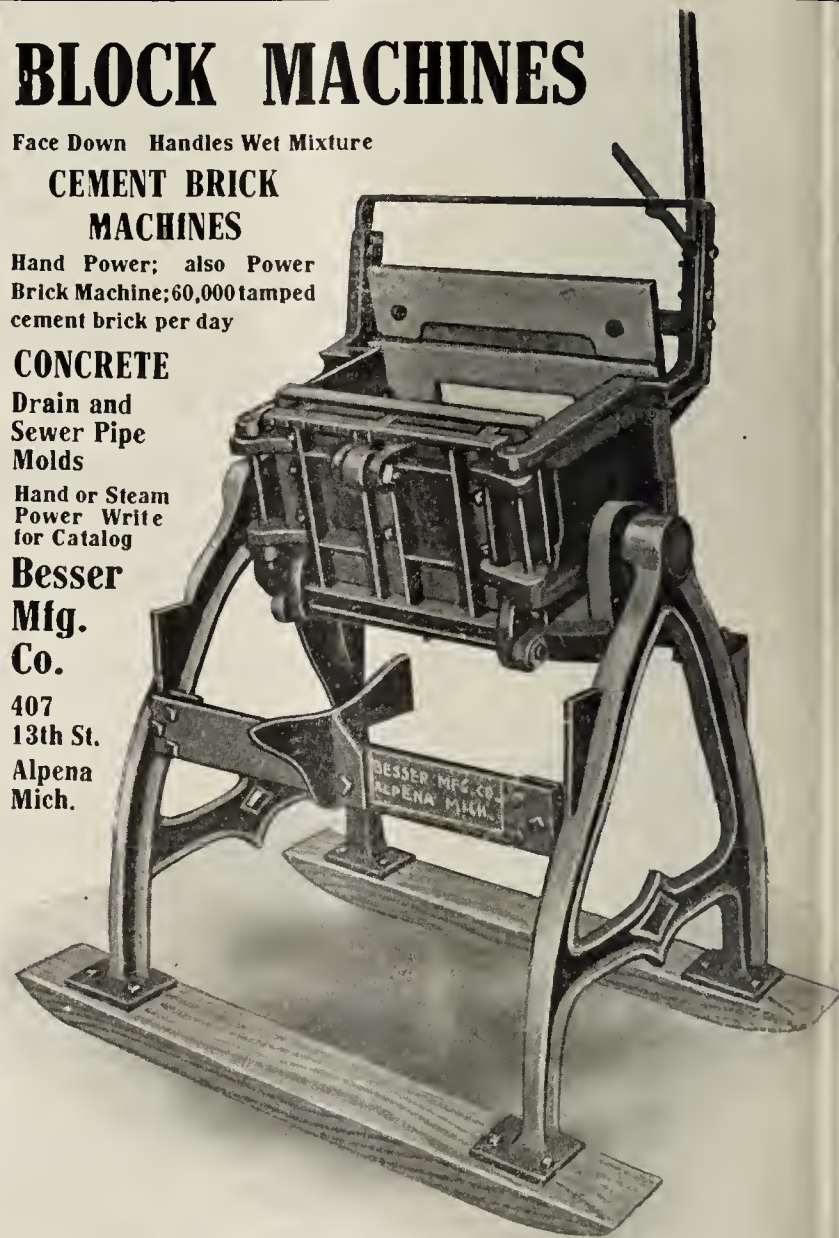
CONCRETE

Drain and
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Hand or Steam
Power Write
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**Besser
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Stocks at many points—Prompt Deliveries

Your rush orders will get quick action. We have stocks on hand nearby. That's part of our service. Special arrangements may be made for quick shipments from any one of our mills, when ordered in car-load lots.

Corrugated Bars are right. You can depend on them. And remember Corrugated Bars infringe no patents.

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WAINWRIGHT STEEL-BOUND CONCRETE CURB

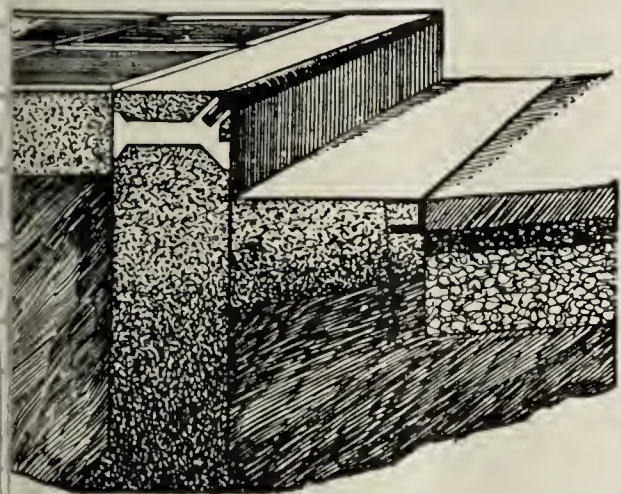
HAS A RECORD OF
SIXTEEN YEARS' USE WITHOUT A FAILURE
ABSOLUTELY NON-BREAKABLE. CHEAPER THAN GRANITE

THIS CURB WILL STAND HARDER
USE AND LAST TEN TIMES AS LONG
AS PLAIN CONCRETE CURBING

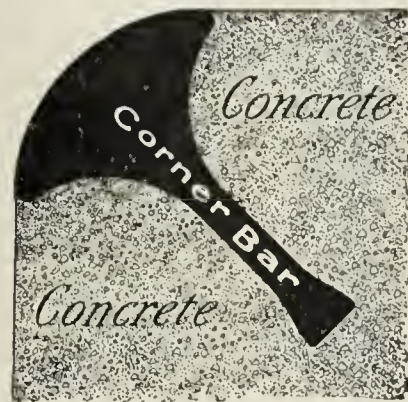
OVER
EIGHT MILLION
FEET

IN USE IN MORE THAN
FIVE HUNDRED CITIES

IN THE UNITED STATES



ALVANIZED STEEL CORNER BAR PREVENTS
CHIPPING OR BREAKING ON
EDGES



MECHANICALLY PERFECT AND
UNEQUALLED FOR CURVED
CORNERS

THE WAINWRIGHT GALVANIZED STEEL CORNER BAR

IS THE ONLY BAR THAT CAN BE DEPENDED ON TO PERMANENTLY RETAIN ITS PLACE IN CONCRETE. THE RECOGNIZED MERITS OF THE WAINWRIGHT BAR HAVE MADE IT THE STANDARD CORNER BAR FOR CONCRETE PROTECTION, AND IT HAS BEEN SPECIFIED FOR YEARS BY THE UNITED STATES GOVERNMENT, LEADING CITY ENGINEERS, RAILROAD OFFICIALS AND RESPONSIBLE CONTRACTORS.

THIS BAR IS SELF-ANCHORING. THE DOVETAILED WEB HOLDING IT FIRMLY IN PLACE EVERY INCH OF LENGTH. PRESENTING A RESISTING DEPTH OF TWO INCHES OF SOLID STEEL. AT EVERY POSSIBLE POINT OF IMPACT.

THE SUPERIORITY OF THE WAINWRIGHT GALVANIZED STEEL CORNER BAR OVER COMPETING DEVICES DUE TO THE SOLID ROUNDED HEAD AND CONTINUOUS INTEGRAL ANCHORAGE. ALSO GREATER WEIGHT RESISTING MATERIAL.

FROST WILL NOT DISPLACE THE WAINWRIGHT BAR AS IT
WILL ANY BAR ANCHORED AT INTERVALS

SEND FOR BOOKLET NO. 4

STEEL PROTECTED CONCRETE CO.

Real Estate Trust Bldg., PHILADELPHIA, PA.

There are no cemented joints to weaken the strength of "Veelos" Balata Belting.



"Veelos" Balata Belting is the strongest belt known to engineers, having a tensile strength of more than 9000 pounds to the square inch.

This belt is especially made for the hardest kind of service, such as cement mills, stone crushers, gravel plants, etc.

It is waterproof, you can run it in water or in the rain, without doing the least injury to the belt.

It does not stretch or shrink, you need not lose time and money in shortening this belt.

Every foot guaranteed, money refunded if not satisfactory.

Write for samples and prices.

Manheim Manufacturing & Belting Co.
Manheim, Lancaster Co., Pa.

Permanent Culvert at Minimum Cost



HALL INTERLOCKING CONCRETE CULVERTS

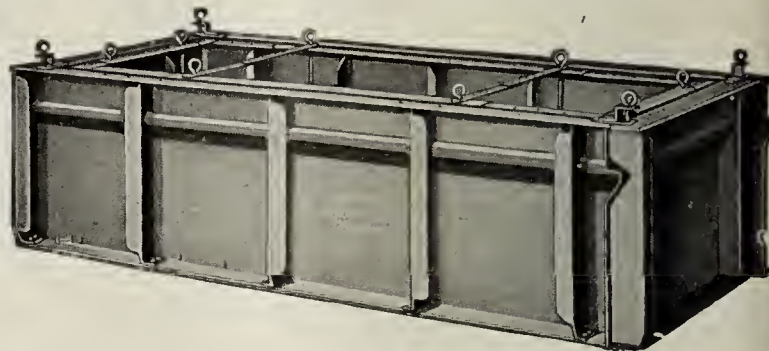
provide *permanent drainage* for roads and highways. Built in interlocking reinforced sections where *careful inspection* may be given the work. Can be installed quickly by *unskilled workmen*. Interlocking feature insures unity and prevents waste of material. No rust, corrosion or breakage.

Easy to manufacture, 5 sections cast at once. A profitable culvert from every standpoint. Collapsible forms for Hall Interlocking Culverts should be a part of every contractor's equipment. Low in price. Last forever. Write for full particulars.

SCHULZ & HODGSON
EASTERN DISTRIBUTORS
948 Association Bldg. CHICAGO

The Burial Vault Business

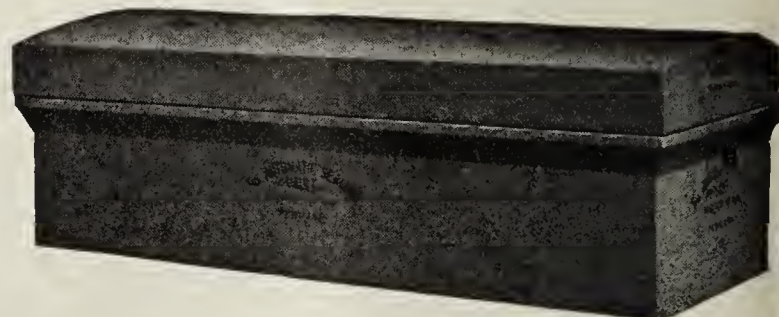
THERE'S no joke about this business. It's sane, solid and sensible. You needn't be ashamed to go into it. You can get business men to back you, because from the very nature of the article a demand for it is increasing right along with the increase in population.



The Adjustable Mold

You can operate this business in connection with a block, brick, tile or post plant, or you can operate it independently. The extent of the vault end of your business depends entirely upon your own enterprise.

Some men first get the idea that you have to peddle vaults at funerals, which naturally stops them from further investigation, but this isn't the right idea at all. You simply work through the undertaker by furnishing him a price that he can sell it for and still enable you both to make a good profit. *CONCRETE* is the ideal vault material—but *ALL* concrete vaults without our patented seal are not a success.



The Vault in Seven Sizes from Above Molds

This much is *CERTAIN*—and a man with very little capital and average common sense and a bit of business energy can start making vaults on a small scale and sell them and make more and sell more until he has a big, well-established money-making business worked up.

BUT—HE MUST START RIGHT—He must be able to make good vaults, at low factory cost—vaults that undertakers would push—vaults that people will demand.

OUR MOLDS are simple, designed so they are adjustable to make 7 standard sizes of vaults, and when the concrete is poured into this mold and has set sufficiently, the molds can be removed, which leaves a smooth surface without the mark of a rivet head showing up.

We sell you the molds outright—no blue sky. You buy the molds at a fair price and they belong to you. But we don't stop there—we help you get started—help you turn out first-class vaults—show you the knacks and methods to get the undertaker lined up.

We'd like to hear from the right kind of men now—the investment required is small, the returns large.

OUR BIG BOOK explains all. Fill out the coupon and mail today.

The Automatic Sealing Vault Co.,
207 East River St., Peru, Indiana.

Gentlemen:—Send me your book about your vault molds and the product they turn out, and what the opportunities are.

Name
Address
State

HYDRATED LIME



What it is and How it is used with Portland Cement

Hydrated Lime is ordinary commercial lime whose affinity for water has been satisfied. In other words, it is slacked lime with the surplus water driven off, leaving a dry, impalpable powder, finer than cement.

When you slake lime in a mortar box on the job, you *hydrate* it. The surplus water in your slaking mixture leaves the lime in putty form.

The value of Hydrated Lime used with Portland cement has long been known to chemists and engineers, but its extensive use in this field is of recent growth.

Lime manufacturers now hydrate their product at the plant and ship it—Hydrated Lime—in 40 or 50 lb. paper bags or 100 lb. burlap bags. Remember, this is a dry, impalpable powder, which can be easily and safely stored. Having been hydrated, there is no fire risk, as additional moisture will not start combustion—a danger encountered in storing commercial lime.

Hydrated Lime, when used in concrete work, helps to fill the voids, producing greater density, which means more nearly waterproof concrete.

Hydrated Lime lightens the color of the concrete, the variation depending, of course, upon the amount of lime used.

Hydrated Lime makes cement mortar more plastic—an important point in stucco work and in brick mortar.

Hydrated Lime enables the concrete to take a clearer impression from molds—the concrete adapts itself to the intricacies of the mold better.

Hydrated Lime lubricates concrete—makes it flow better—for instance, when distributing by chute.

Full detailed information of the methods and cost of using this material may be secured from any of the following competing manufacturers of Hydrated Lime:

Longview Lime Works, Birmingham, Ala.	Glencoe Lime & Cement Co., St. Louis, Mo.	Rapid City Gypsum, Lime & Portland Cement Co., Rapid City, S. D.
Saginaw Lime & Lumber Co., Saginaw, Alabama.	Dutchess County Lime Co., Dover Plains, N. Y.	Gager Lime & Mfg. Co., Chattanooga, Tenn.
Charles Warner Co., Wilmington, Del.	Rockland & Rockport Lime Co., 101 Park Ave., New York, N. Y.	Dittlinger Lime Co., New Braunfels, Tex.
Marblehead Lime Co., Chicago, Ill.	The A. & C. Lime Co., Canton, Ohio.	Round Rock White Lime Co., Round Rock, Tex.
Ohio & Western Lime Co., Huntington, Ind.	Kelley Island Lime & Transport Co., Cleveland, Ohio.	Riverton Lime Co., Riverton, Va.
Security Cement & Lime Co., Hagerstown, Md.	National Lime & Stone Co., Carey, Ohio.	International Lime Co., Sumas, Wash.
Lee Lime Co., Lee, Mass.	John D. Owens & Son Co., Owens, Ohio.	Standard Lime & Stone Co., Fond du Lac, Wis.
Charlevoix Rock Product Co., Charlevoix, Mich.	Woodville Lime & Cement Co., Toledo, Ohio.	Union Lime Co., Pabst Bldg., Milwaukee, Wis.
White Marble Lime Co., Manistique, Mich.	National Mortar & Supply Co., Pittsburgh, Pa.	

WANTED & FOR SALE DEPARTMENT

WANT COLUMNS.

Advertisements in this column are inserted at the rate of two dollars per inch per issue—and no advertisement will be taken for less than two dollars and must be paid strictly in advance.

Chief chemist, at present employed, desires change of location. Can furnish best references from past and present employers. College graduate. 12 years' successful experience. Address W., care Cement & Eng. News, Transportation Bldg., Chicago.

FOR SALE.

We can save you 25 to 50 dollar on a concrete mixer. High grade machines, fully guaranteed. Get our price before you buy. Superior Mfg. Co., 1405 Concrete Ave., Waterloo, Iowa.

HOTEL EMPIRE

Broadway at 63rd Street



NEW YORK CITY.

In the Very Centre
of Everything.
Subway and Elevated R. R.
Stations One Minute.

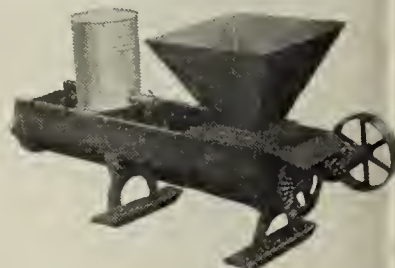
Five Minutes Walk to 40
Theatres and All the Famous
Shops. All street cars
and 5th Av. Motor Buses
Pass our Door.

Coollest Rooms In Town
Large Outside Rooms, use
of Bath, 1 Person, \$1.00,
2 Persons, \$1.50. Large
Outside Rooms, Private
Bath, 1 Person, \$1.50, 2
Persons, \$2.00. Parlor,
Bedroom and Bath, 1 Per-
son, \$2, 2 Persons, \$2.50.

Special Rates for Long and
Short Periods. A Place
Where Nice People Dine.

Your Visit to New York Is
Not Complete Unless You
Stop at the Famous Empire.

ONLY \$26.00 FOR X-L All Continuous BATCH MIXER



We make the largest line of small Batch and Continuous Mixers on the market. Whether you are a Cement Block, Brick, Tile Manufacturer or a Contractor, or whether you have a mixer, you should send for our literature as we make a specialty of manufacturing concrete mixers for different lines of work.

The chances are that it might pay you to discard your old mixer after you see the X-L All Special and we know it will pay you to investigate if you have use for a concrete mixer.

Burrell Manufacturing & Supply House
KANKAKEE, ILL.

THE COAST LINE TO MACKINAC DETROIT, CLEVELAND, BUFFALO, PT. HURON, ALPENA, NIAGARA FALLS. TOLEDO, ST. IGNACE.

A LAKE TRIP FOR REST AND RECREATION

Have a real vacation on the Great Lakes, the most enjoyable and economical outing in America. The cool lake breezes, the ever-changing scenes along the shore, and the luxurious steamers of the D. & C. Line are positive guarantees that you will enjoy every minute of your trip, and return home refreshed and glad you went. Daily service between Detroit and Cleveland and Detroit and Buffalo. Four trips weekly from Toledo and Detroit to Mackinac Island and way ports. Two trips weekly, special steamer, Cleveland to Mackinac Island, no stops enroute except Detroit and Alpena. Special day trips between Detroit and Cleveland during July and August. Daily service between Toledo and Put-in-Bay. RAILROAD TICKETS AVAILABLE FOR TRANSPORTATION on D. & C. Steamers between Detroit and Buffalo or Detroit and Cleveland either direction. Send two-cent stamp for illustrated pamphlet and Great Lakes map. Address L. G. Lewis, G.P.A., Detroit, Mich.

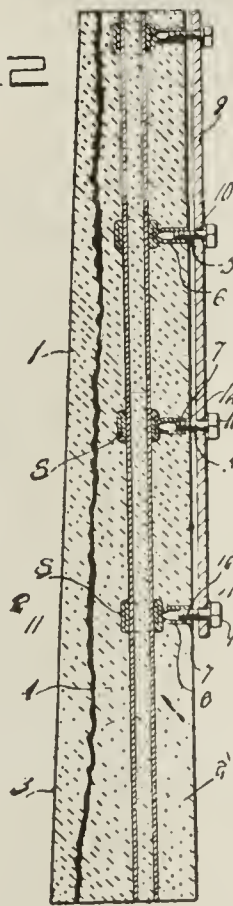
Detroit & Cleveland Navigation Company
Philip H. McMillan, Pres., A. A. Schantz, V.P. & G.M.
All Steamers arrive and depart, Third Ave. wharf, Det.



The Post that Will Not Rust, Rot, Break or Burn, but Gets Better Every Year THE UNIVERSAL CEMENT POST

PATENT NO. 1,107,406

FIG. 2



is the only cement post to which a plank fence may be attached without the use of a single nail. It is the only cement post which holds the fence in such a manner that it is impossible for cattle to ride it down, or hogs to go under it.

Further, it is the only cement post for building speedway and ball park enclosures; fastening of boards is an easy matter.

This post will not break at the ground. Our special process of reinforcing takes good care of that part. Can be made in any shape, design or length to match any design one may want to carry out.

The Universal Cement Post is the only all-feature post on the market. Large corporations want this post. A live state agent is wanted to take care of the demands for this post in each state and Canada.

My mutual plans will be profitable to all concerned. Write at once. Address all correspondence to

F. W. GOTTLIEB

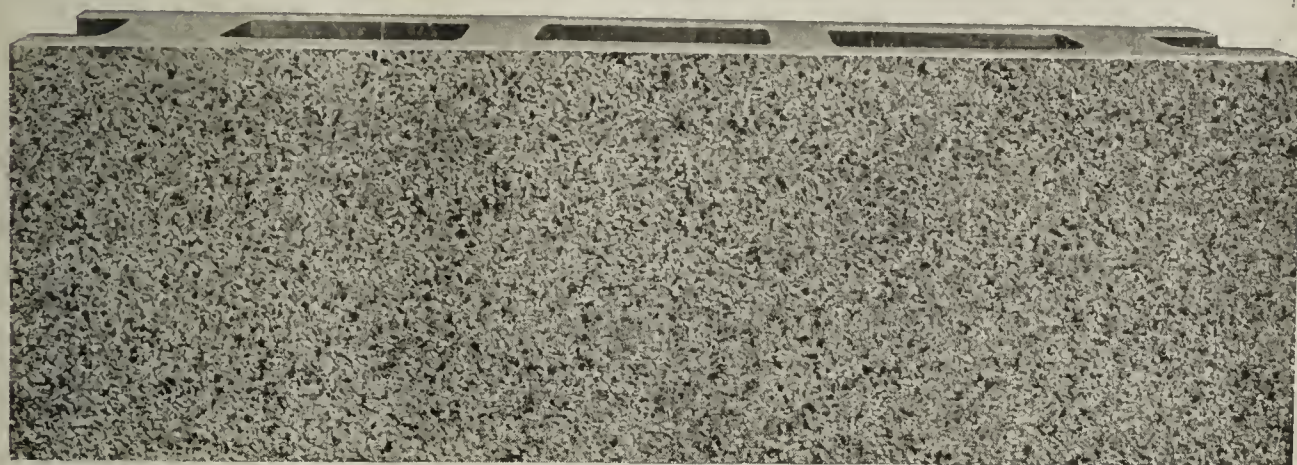
General Agent
MORRISTOWN, INDIANA

SERIAL NO. 829,291

ZAGELMEYER SYSTEM

OF CASTING

Hollow Cement Building Blocks WITH GRANITE FACES



8x8x24 inch Granite Smooth Face Block

*They Cost Less
They Sell for More
You Sell More of Them*

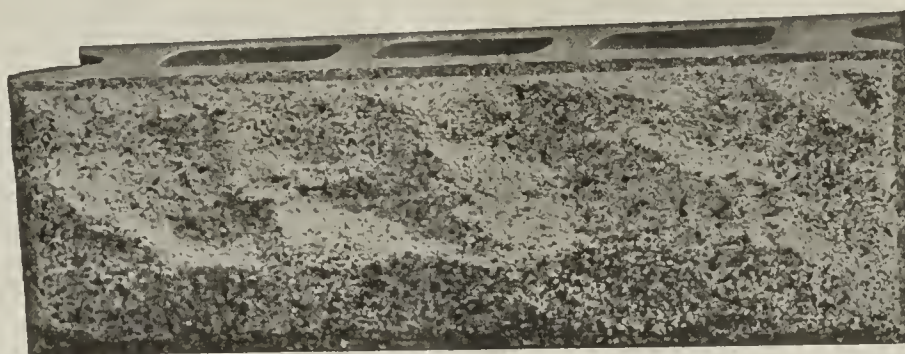


Enlarged View of Granite Smooth Facing

BY A NEW process, which protects the facing, while the block is being cast, we eliminate all traces of cement from the face of block and nothing but the GENUINE GRANITE SHOWS IN ALL ITS SPARKLING BEAUTY.

These cuts show blocks just as they came from the molds, they are not treated with acid or scrubbed with brush, or sprayed.

We challenge the whole world to show us a cement block, made by any other system, at any cost, that equals these blocks for beauty, strength, quality or imperviousness to heat, cold or moisture.



8x8x24 inch Granite Rock Face Block

Send us fifty cents and we will send, freight prepaid, to any point in the United States, east of the Mississippi and north of the Ohio Rivers, a granite-faced block, one-half rock-faced and one-half plain-faced. YOU WILL SAY WHEN YOU GET IT THAT YOU NEVER SAW A CEMENT BLOCK BEFORE.

They are positively cheaper to make than the ordinary dry-tamp, sand faced block.

MR. BLOCK MAKER: What show will you have if your competitor secures the exclusive right for this system in your city?

ASK US ABOUT OUR MOLDS FOR MAKING SILO BLOCKS.

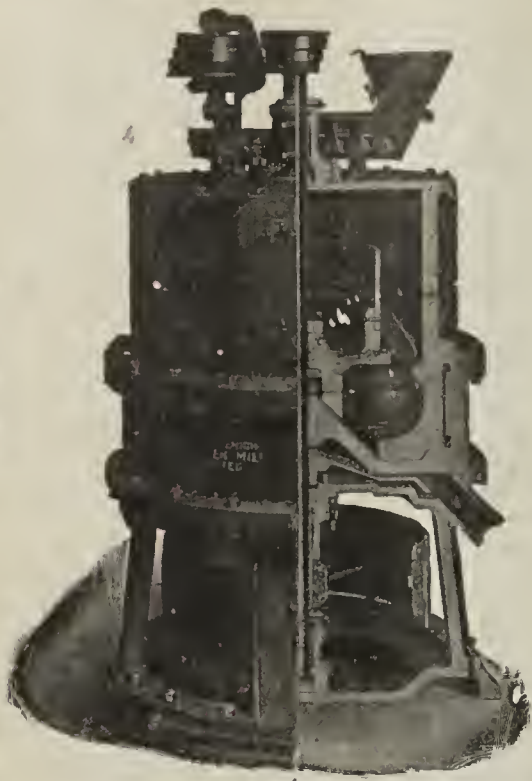
Send for a Catalog fully describing our system and showing our multiple molds mounted on trucks, for casting hollow cement building blocks.

Zagelmeyer Cast Stone Block Machinery Company

25 Crump Avenue

BAY CITY, MICHIGAN

The Fuller-Lehigh Pulverizer Mill.



Produces Commercially

Cement having a higher percentage of Impalpable Powder than can be obtained by any other mill. Tests show that the tensile strength of a 1-5 mortar made with cement pulverized by the Fuller Mill is higher than the tensile strength of a 1-3 mortar made with cement pulverized to the fineness required by the Standard Specifications.

Lehigh Car, Wheel & Axle Works

Main Office: Catasauqua, Pa.

New York
N. Y.

Hamburg
Germany

Cement Companies
equipped with
Fuller Mills
advertise the fact that
The consumer
gets
38 pounds more
of the
Impalpable Powder
or
Real Cement
in every barrel of
cement produced by
The Fuller Mill
than by any other.



"OLD RELIABLE" "XX"—Our Motto is "QUALITY FIRST"

You may buy some cheaper grades of Shovel Chain than "XX" but our High Grade "XX" Chain is always cheaper in the end. Send for catalogue and prices.

"OLD RELIABLE"
"XX" SHOVEL CHAIN

Some manufacturers make several grades of so-called Shovel Chain. We make one grade.

Made only by THE HAYDEN CORBETT CHAIN CO.,

Columbus, Ohio

WE CAN MAKE PROMPT SHIPMENTS OF

DU PONT

EXPLOSIVES

AND BLASTING SUPPLIES

DESPITE the present demand for explosives, our facilities for securing materials, the operation of extensive powder plants equipped with special machinery and expert employes, and ample storage and shipping arrangements enable us to promptly and satisfactorily fill all orders.

Over a century's experience in the explosive field gives us a practical knowledge of its requirements. The superiority of our products is recognized by world-wide demands.

Specify DU PONT when purchasing explosives and blasting supplies, and be assured of prompt shipments, uniform quality and maximum efficiency.

DU PONT POWDER CO.

Established 1802

WILMINGTON, DELAWARE

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SEP 10 1915

CEMENT AND ENGINEERING NEWS

pl. 27

TRANSPORTATION BUILDING, CHICAGO, AUGUST, 1915

No. 8

F. L. SMIDTH & CO. ENGINEERS

50 CHURCH STREET

NEW YORK CITY

Designers, Equipppers and Builders of
Portland-Cement-Making Factories

KRUPP

Grinding
Machinery

THOS. PROSSER & SON

24 Platt St., NEW YORK

Old Colony Bldg., CHICAGO



SPECIAL OFFER

You have experimented with many waterproofing compounds containing "Stearates" or other Soaps. IMPERVITE is not a soap; it is the only compound which is an "Asphaltic Emulsion."

One pound of Impervite is better than two pounds of Soap Compound.



We can send you Official Government Tests and scores of enthusiastic letters from Users—but will this SATISFY you?

In order to give you an opportunity to PROVE our claims, we are willing to send you 25 pounds of Impervite for \$2.00 (freight prepaid by us) with the understanding that if it does not prove more efficient than the com-

pound you are now using, you will be under no obligation to pay us

We are willing to let YOU be the judge. Write today.

The Standard Paint Co.

NEW YORK BOSTON CHICAGO



TRADE MARK

Chas. A. Schieren Company

ESTABLISHED 1868

Tanners
Belt Makers

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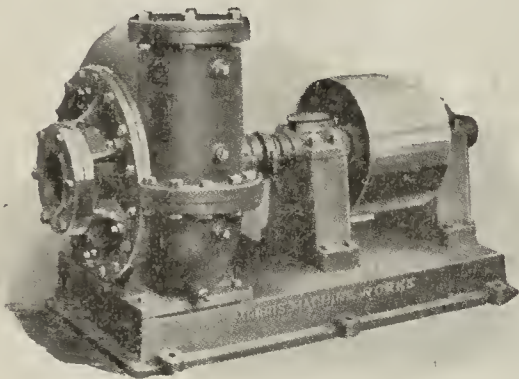
SEATTLE, 620 1/2 Fourth Ave.

The Texas Chas. A. Schieren Co., Inc., 106 S. Market St., Dallas, Texas

MORRIS

Solid Lined

Dredging Pumps



EVERYTHING that enters into the construction of the Morris Solid Lined Dredging Pump is of heavy proportions and the general design is such that wear is reduced to the smallest possible extent. Its ability to outlast other dredging pumps is its chief claim to economy.

By removing the upper half of the pump shell, the lining can be taken out or by removing the disc on the pump shell and the inner disc on the lining, the runner can be taken out. The pump is easily and quickly taken apart if necessary to replace lining or piston.

*Write for Sand and
Gravel Pump Catalog*

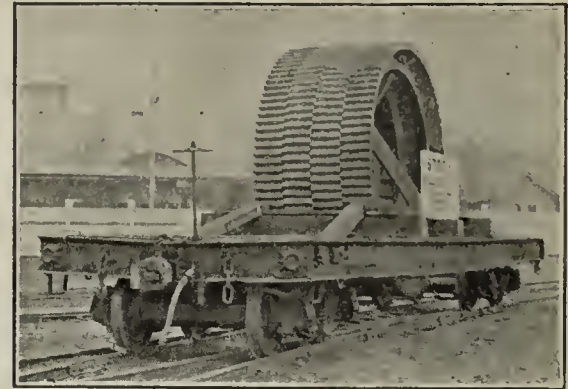
Morris Machine Works

Baldwinsville, N. Y.

NEW YORK OFFICE, 39 Cortlandt Street

HENION & HUBBELL, General Agts.
227 No. Jefferson St., Chicago

Stroh Process



First shipment of gears for Universal-Portland Cement Company's plant of Duluth which is being equipped with Stroh Process Gears and Pinions.

Pinions and Gears

Grinding Plates

Crushing Plates

Track Wheels

Sprockets

Sheaves

Liners

Mantles

Concaves

WEAR-PROOF - LOW PRICED



Trade Mark
Registered



Fracture of
Involute Tooth

MADE EXCLUSIVELY BY

Kennedy-Stroh Corp.
PITTSBURGH, PA.

Complete Grinding IN ONE MACHINE

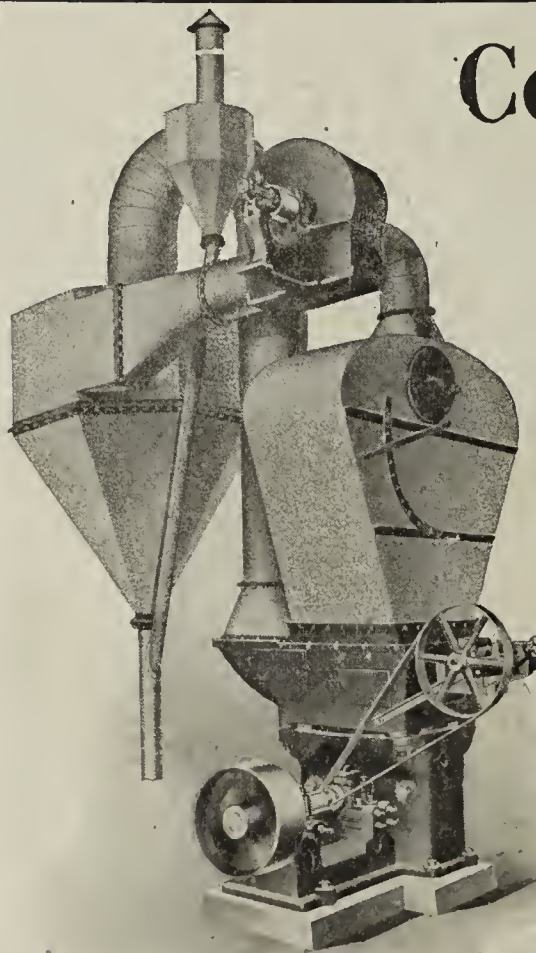
In successful use grinding
Cement, Clinker, Lime-
stone, Coal

INSTANT REGULATION
OF FINENESS

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THE BONNOT CO.
CANTON, OHIO



Pivoted Bucket Elevator-Conveyer for handling Coal and Ashes in Power Plants; for handling Raw Materials and Clinkers in Cement Mills. **Send for Bulletin 32-14.**



Belt Conveyer in large Stone Crushing Plant. Note how rigid and compact the Jeffrey Self-Propelling Tripper is built. **Send for Bulletin No. 167-14.**

Overlapping Drop Pan Carrier for Clinker, Cement, Earths, Ores, Coal, etc. Can be installed to deliver at various fixed points into Bins or Chutes.



Reduce Your Labor Expense

The Popular and Economical Method for Increasing Plant Efficiency and Capacity and Lowering Operating Costs is by the use of Labor-Saving Equipment to secure rapid and economic handling of Raw and Finished Materials.

40 Years of Continuous Success in the Design and Construction of Equipments, solving all kinds of handling problems, is back of Every

JEFFREY STANDARD ELEVATOR and CONVEYOR

We have recently issued

Our New General Catalog No. 83-14 which illustrates and describes many installations. Probably the very outfit to meet your requirements is pictured in this book. It also tells about our complete line of Crushing, Pulverizing, Screening and Power Transmission Machinery, including the Service Application of our STANDARD Chains for every service.

Send for copy.



Self-Propelled Portable Wagon and Truck Loader. Capacity, 1 to 1½ cubic yards (per minute) of Crushed Stone, Sand, Gravel, Cement, etc. **Write for Bulletin No. 165-14.**

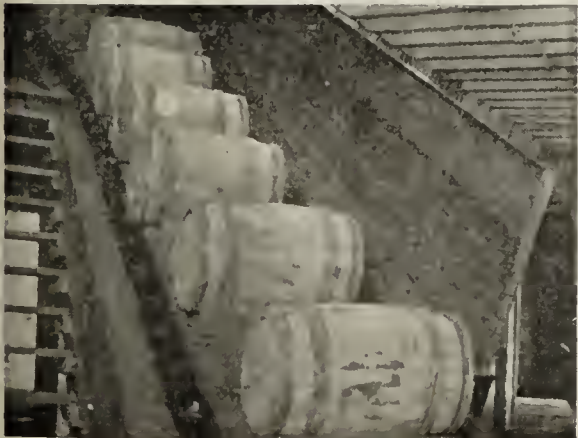


Crushed Stone Elevator of large capacity showing continuous buckets mounted upon double strands of Jeffrey "Hercules" Chains. **Write for Bulletin No. 143-14, "Elevator Buckets."**

Jeffrey Mfg. Co., 914 North Fourth Street, Columbus, O.

New York Boston Philadelphia Charleston, W. Va. Birmingham Chicago Denver Montreal

Jeffrey Apron Conveyer handling 1,200 filled barrels per hour. Handles Miscellaneous Packages weighing up to 1,000 pounds each.



Continuous Double Strand Roller Chain Conveyer handling 700 sacks of lime (weighing 100 pounds each) in Filtration Plant. It carries on the level and up a steep incline.

Double Strand Roller Chain Apron Conveyer set in level with floor. It carries into and out of storage.

Write for Bulletin No. 74-14 on Freight and Package Handling Machinery.



Superior Jaw Crushers

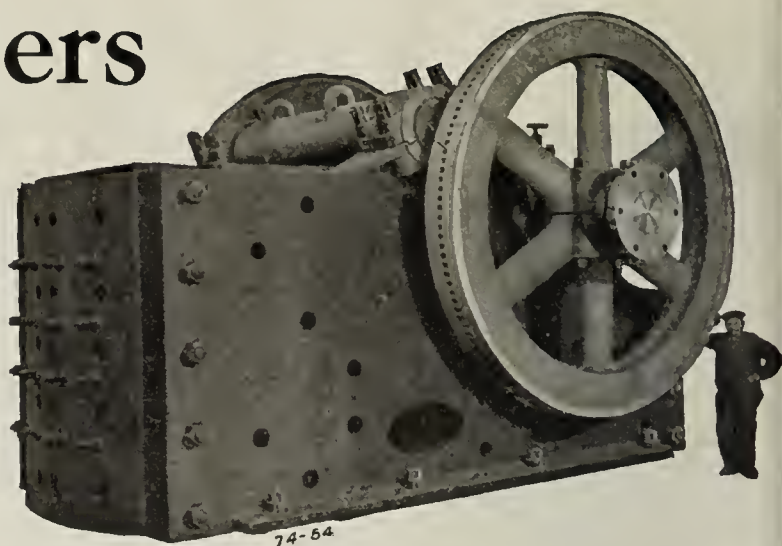
Particularly adapted for Cement Plants—For use in connection with Steam Shovels of largest size. Size of Feed Openings—36"x24"—42"x40"—60"x48"—84"x60". The advantages are—Large Feed Openings—Low Initial Cost—Low Cost of Maintenance—Low Power Consumption—Saving in Dynamite—Saving in Labor over hand loading, and above all ABSOLUTELY RELIABLE. One of our 84"x60" Superior Jaw Crushers crushing hard trap rock has been in operation for nearly five years without the replacement of a *single part*. Described in our Bulletin No. 44—108.

Power & Mining Machinery Co.

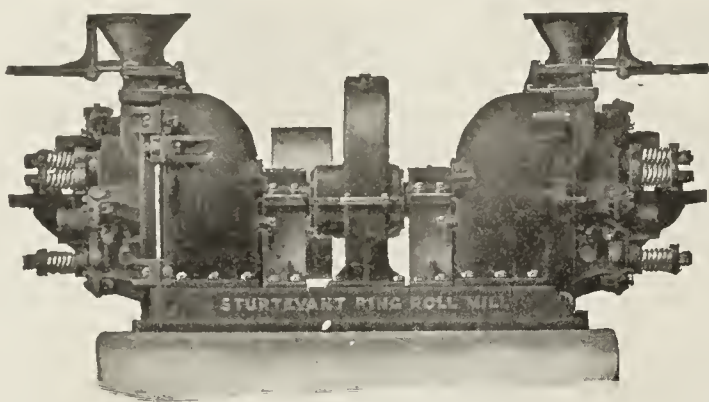
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M 315.2



STURTEVANT RING-ROLL MILL

For CLINKER, LIMESTONE and COAL
THE LARGEST PRELIMINARY GRINDER BUILT

CAPACITY PER HOUR ON CLINKER

80 TO 120 BBLs.	TO 20 MESH WITH	80 — 90 H. P.
50 " 80 "	" 40 "	80 — 90 H. P.
50 " 60 "	" 80 "	80 — 90 H. P.

UPKEEP APPROX. 10c. PER BBL.

The Ring-Roll Tube Mill Unit can produce cheaper cement from every standpoint — upkeep capacity, low power and continuous operation than any other. Ask the users, they can prove it to you, and we can.

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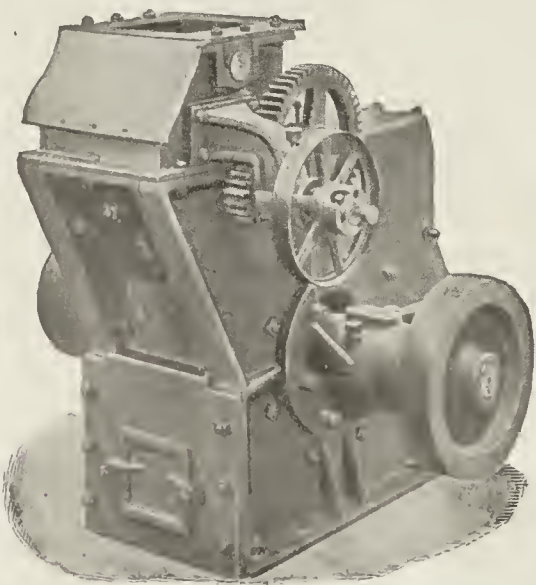
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PULVERATORS

FOR PULVERIZING RAW MATERIALS



Any capacity, producing 50% to 65% of product through 200 Mesh Sieve, increasing tube mill output, fineness, and value of your product. Write for Bulletin No. 4028, describing Pulverators — pulverizing by a new principle.

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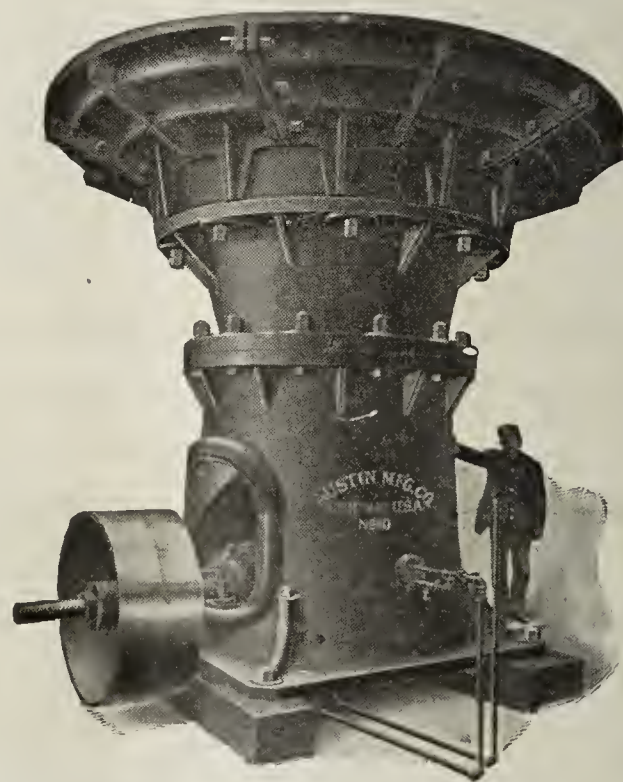
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The world's leading Ore and Rock Crusher. Its many superior qualities and mechanical advantages have won the highest reputation amongst Mining Engineers and Quarrymen.

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Jones Superiority

Insure the successful operation of your plant
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THE JONES

Line of Transmission Machinery

Is used by progressive manufacturers throughout the United States. We have our own foundry, machine shops, metal working department, pattern departments, etc., etc. We employ first-class help in all departments and use high-grade materials. When you are in need of anything in our line, try us. We manufacture a complete line of

POWER TRANSMITTING MACHINERY

Pulleys, Gears, Rope Sheaves, Friction Clutches, Belt Conveyors, Shafting, Conveyors, Sprocket Wheels, Gears, Hangers, Buckets.



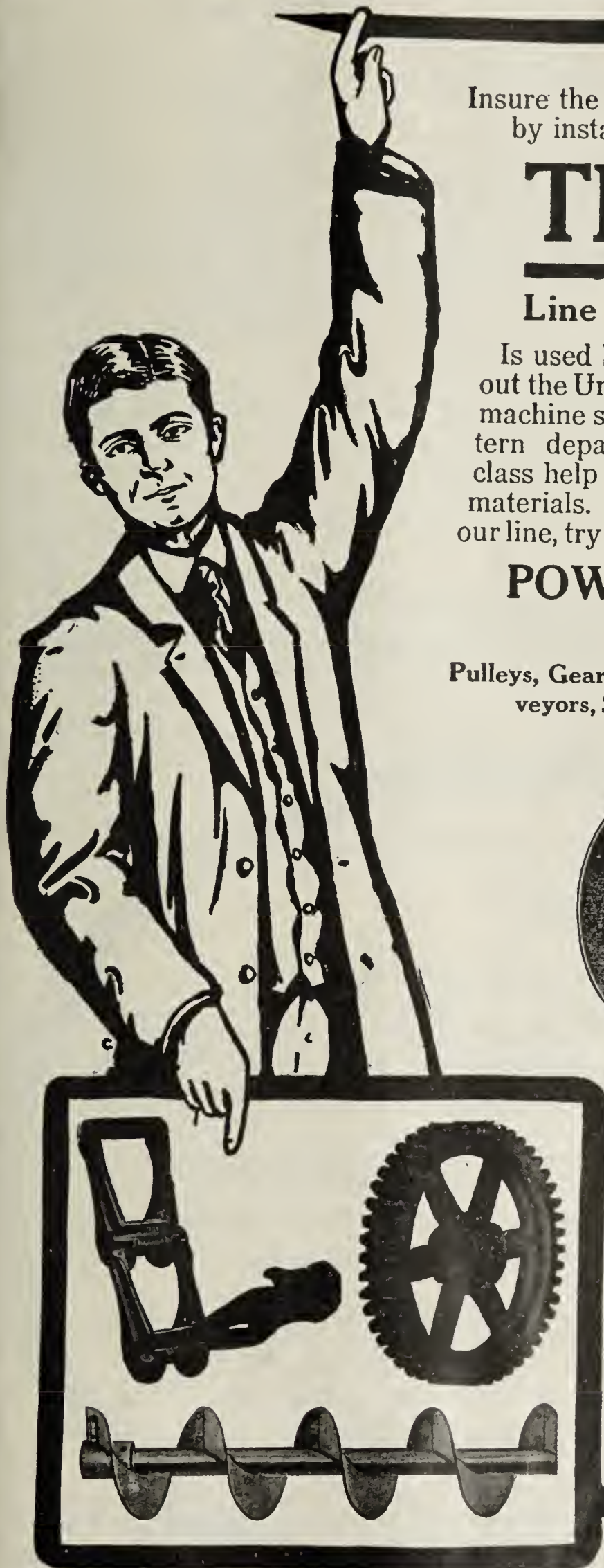
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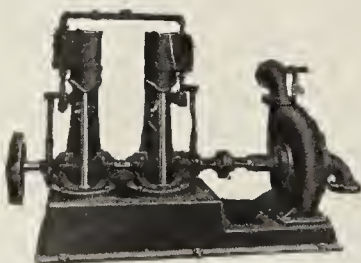
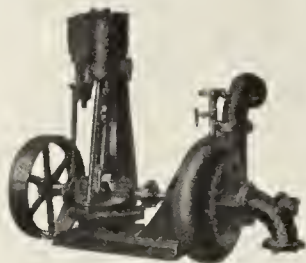
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are our specialty. We build a full line of Standard Pumps for the most common requirements as well as a complete line for High Heads, either Motor Driven or Engine Driven.

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Successors to the Erie Pump and Engine Works
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"AGE of SAFETY"

AN ABSOLUTE NECESSITY

This "Age of Safety" demands protection of human life by every available, reasonable and practical means. The

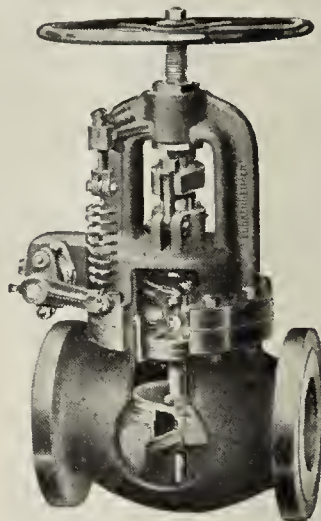
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Non-Return
Safety Boiler Stop
Valve

will automatically close and instantly cut out a boiler connected in battery, when the pressure within the boiler suddenly drops below that of the header.

It thereby prevents injury to boiler room operatives, and facilitates the safe and continued operation of the other boilers without loss of time.

Globe and Angle Patterns, sizes 3 to 10 inches inclusive, for working steam pressures up to 350 pounds.

Ask your dealer for descriptive booklet, or write for catalog.



It will prevent steam being turned into a disabled boiler, or one that has been cut out for cleaning or repairs, as the valve cannot be opened by hand. It can, however, be positively closed at any time.

When placing a boiler in service, it will not open until the boiler generates steam to a pressure equal to that of the others of the battery.

The improved construction of the disc, dash-pot and balance mechanism

relieves the shock incident to the condition of operation.

"An absolute necessity" to every boiler connected in battery.

THE LUNKENHEIMER CO.
—"QUALITY"—

Largest Manufacturers of
High Grade Engineering Specialties
in the World

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"THE TWENTY-FIRST CENTURY BAG"

"VALVE BAGS"

THEY ARE THE BEST
FOR CEMENT, LIME,
PLASTER, ALCA,
GROUND STONE, ETC.

SAVE MONEY AND TIME BY USING THEM

They Are Easier to Handle and More Economical

The Strongest Paper Bag Made

BATES No. 1 ROPE VALVE BAG

(PATENTED)

Write us for Samples and Quotations



The Urschel-Bates Valve Bag Co.

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Manufacturers of
Open Mouth and Valve Bags

100
Years
Ahead of
All the Rest

\$1,000 Saved by using a Thomas Electric Hoist

AFTER THE FIRST YEAR'S
USE OF A THOMAS ELEC-
TRIC HOIST WE SAVED
\$1,000 IN OPERATING EX-
PENSES, IN THE ITEMS
OF FUEL AND LABOR
ALONE.

Here-
tofore we
used steam pow-
er and always had
expenses for broken parts,
boiler repairs, oil and waste,
grates, loss of time from shut-downs, etc.

Read What One User Says

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WASHED SAND AND GRAVEL

GRAVEL BOATH 32nd & FALL CREEK

OFFICE WITH CONSUMERS FUEL COMPANY
LIBERTY AND MARYLAND STREETSTELEPHONE
OFFICE NEW 711
GRAVEL BOATH Old North 17

INDIANAPOLIS IND. Feb. 9, 1914

Thomas Elevator Co.,

Chicago, Ill.

Gentlemen:

After our first year's use of one of your 50 H.P.
Electric Hoists, we feel it our duty to express to you our
appreciation of its worth. We are more than satisfied with
it, and know it is the best investment we ever made.

From calculations made at the close of our year's
business, we find we have saved more than \$1000.00 in operating
expenses in the items of fuel and labor alone, not including
boiler repairs, oil and waste, grates, broken parts and loss of
time from shut downs, which would run a few hundred dollars
more. Heretofore we used steam for power altogether and have
changed to electric since last February.

We have had no repairs whatever on our electric hoist
and have used less than \$2.00 worth of oil.

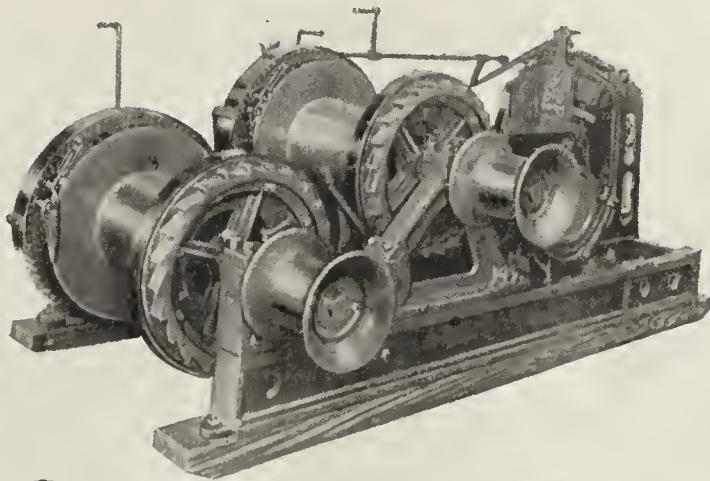
You may take the liberty to refer anyone to us.

Yours very truly

MAXWELL GRAVEL COMPANY

Per *Stewart W. Maxwell*

Thomas Electric Hoists are
built to meet the require-
ments of speed, efficiency,
economical operation and
substantial construction
for all classes of work.



Before buying a hoist get our
catalogue

THOMAS ELEVATOR COMPANY

18 SOUTH HOYNE AVENUE
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JOIN THE ARMY OF SATISFIED USERS OF ELECTRIC FURNACE STEEL CASTINGS

It's a self evident fact that the purer a steel the better its properties.

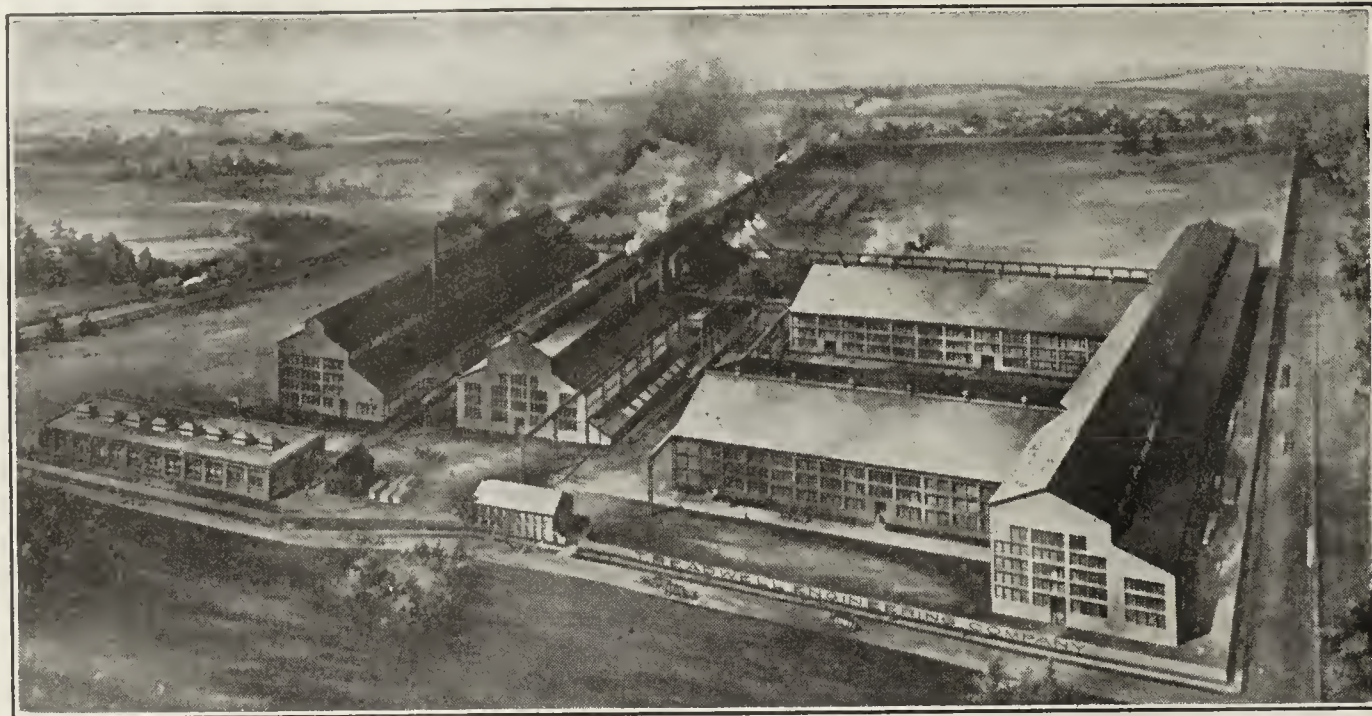
The *superior purity* of electric furnace steel is *unquestionable*. (See Iron Age, issue of April 23rd, 1914)

No oxides
No segregation

Low phosphorus
Low sulphur

High tensile strength
High elastic limit

Greatest resistance
to wear and fatigue



Castings of Special Analyses
for Cement Mill Machinery

Give 50% to 100% additional
service

Grinding Rings, Liner Plates
Yokes, Pushers
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Grey Iron Castings from
1 Lb. to 35 Tons

Grate bars for all styles of dryers

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Cutting Off Machines

Machinery Designed for
Special Purposes

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Henry Heil Chemical Company

210 to 214 South Fourth Street, ST. LOUIS, MO.

We make a specialty of
supplying cement works with

Chemical Apparatus, Chemicals and Reagents

Gilmore's Needles, Cement Moulds, Vicat Apparatus,
Schumann's, LeChatelier's and Jackson's
Specific Gravity Apparatus, Etc.

**Pyrometers, Calorimeters
High Grade Goods Only**

Write for our Large Illustrated Catalogue



Gear Spur Reductions made in any horse power and any reduction

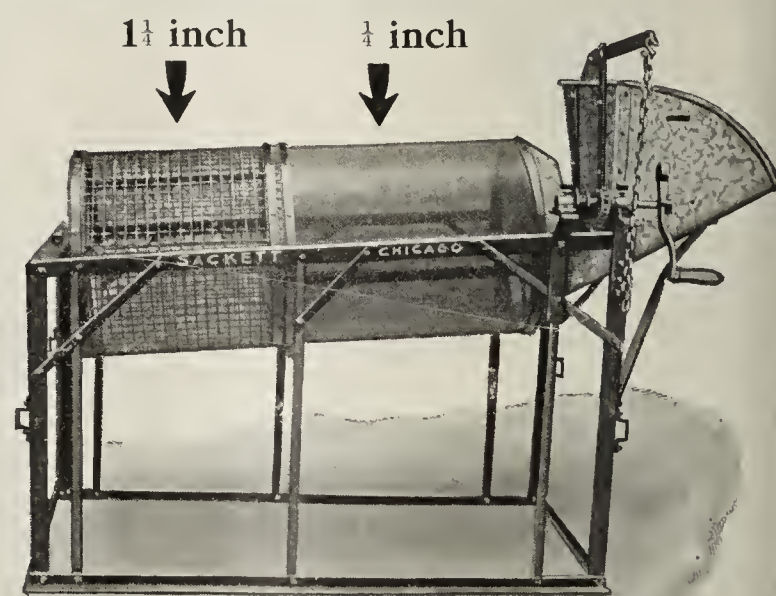
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We have the largest
plant in the West,
equipped with the
latest improved tools
Quick deliveries,
low prices and first-
class work our motto

**FOOTE
BROS.**

Gear & M. Co.
210 to 220 N. Carpenter St.
Chicago

Bank-Run Gravel seldom has the right proportion



Since there is usually too much sand in proportion to the pebbles, *Cement is Saved* and a better concrete obtained by screening the sand from the pebbles and then remixing them in the right proportions. All pebbles larger than 1 1/4 inches are usually discarded. All material less than 1/4 inch is considered sand.

A Sackett-Rotary does this in one operation for you.

Send for our Special Screen Circular.

H. B. Sackett Screen & Chute Co.

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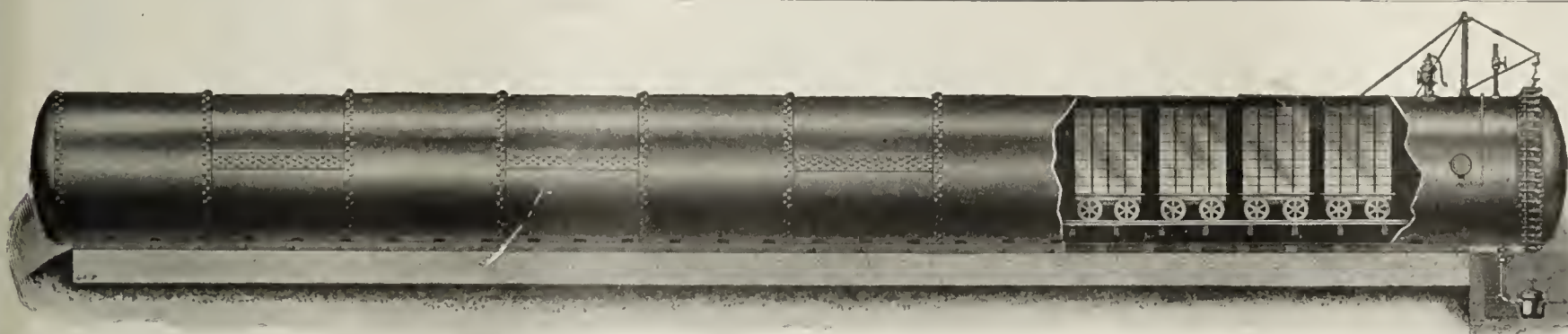
Sand Lime Brick Machinery

Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

Correspondence solicited

The American Clay Machinery Co.

WILLOUGHBY, OHIO



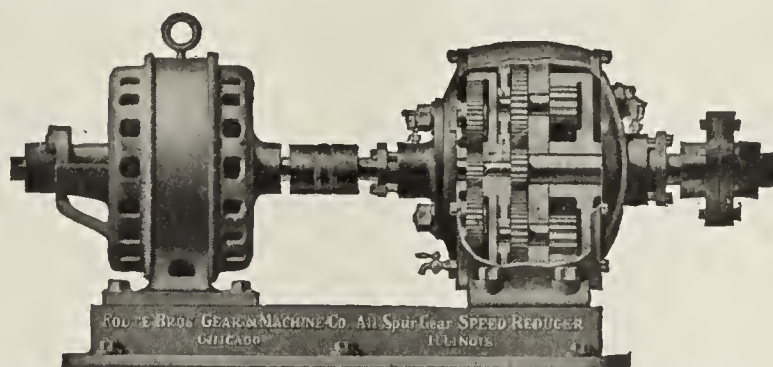
HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs—no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our No. 38 Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

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SPUR GEAR SPEED REDUCERS

Note they are dust proof, compact, made in any horse power or reduction. Just what is needed on conveyors, elevators and reduction of speed anywhere. **We manufacture cut gears.** Send for catalogue.

Foote Bros. Gear & M. Co.

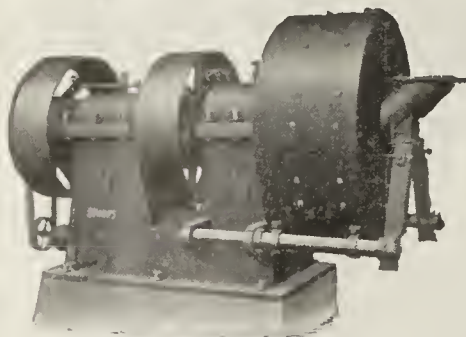
210 to 220 N. Carpenter St., Chicago

SYMONS DISC CRUSHERS

THE DISCS

Are made of manganese steel.

They revolve in the same direction, at the same speed, the inner disc having a vibrating motion which produces a nipping action.



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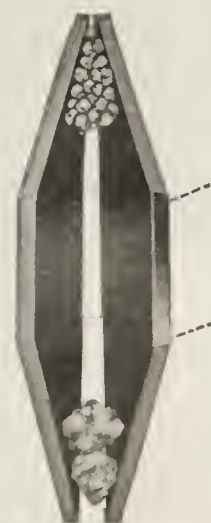
Manufactured and Sold Only by

THE DISCS

Have no abrasive action as found in other types of crushers.

Easily adjusted.

Continuous operation.



Chalmers & Williams, 1457 Arnold St., Chicago Heights, Ill.

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It is your guarantee of Reliability. Each link is made of the very best materials subjected to rigid tests, and careful inspection before shipment.



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—We also make—

**Dippers, Dipper Teeth,
Solid without weld
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Also Dipper Bails and Hinges

We also carry in stock and are prepared to furnish parts for any and all makes of Vulcan Shovels and Dredges. We do all kinds of iron and steel forging and boiler work.

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are being used by the leading contractors and building material dealers throughout the country. They will show a profit on your work.

Let us submit actual figures applying to your present situation.



Gramm-Bernstein Trucks Are the Road Builders Time and Money Saver

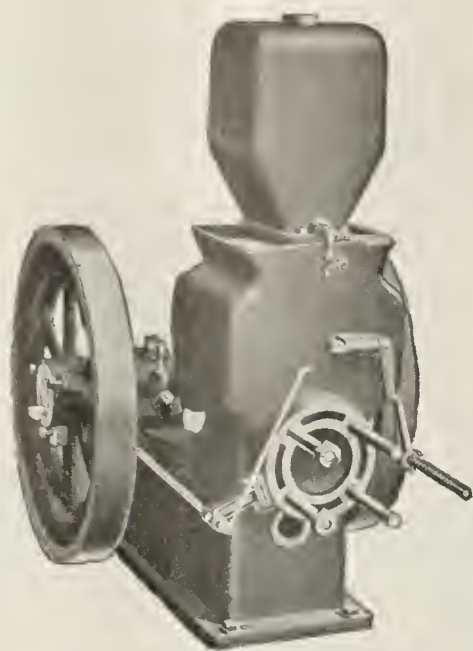
Why rent slow teams? Own your motor truck. By actual experience it has been shown that a 3½ ton truck equipped with 8 foot body, can do the work of five teams per day on road construction. **This saving in a year's time amounts to more than enough to pay for the truck.**

A truck requires no pasture. You don't have to feed it when it is not working. The only operating expense occurs when it is operating. Why not go into this truck matter right now and find out how much money you are spending for teams that you could save by using a truck?

Write today for detailed information and catalog.

THE GRAMM-BERNSTEIN CO., LIMA, OHIO





The Engine with the Troubles Left Out

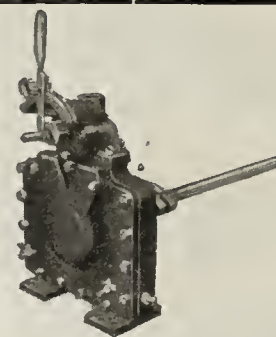
(4 H. P. Type with Cylinder Head Removed)

We are now prepared to offer you our latest type of KEROSENE ENGINES which have the distinctive features of starting directly on kerosene oil.

No Batteries	No Carburetors	No Hot Tubes
No Magnetos	No Torches	No Hot Balls
	No Troubles	

Users and owners should know about this efficient and fuel-saving engine. Your correspondence is solicited.

The A. M. Castle Engineering Co., Inc.
327 Fay St., - La Crosse, Wis.

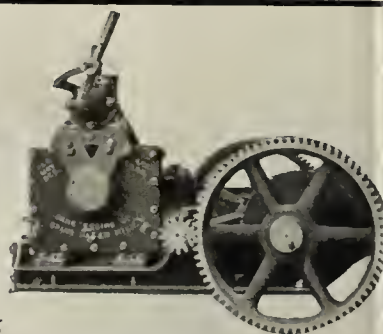


Reversing Steam or Air Motor

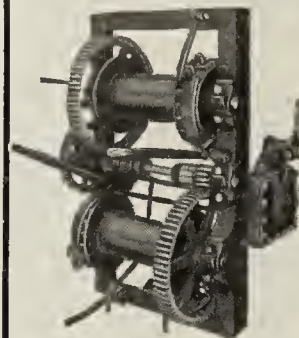
Dake Engine Co.

Grand Haven,
Mich.
U. S. A.

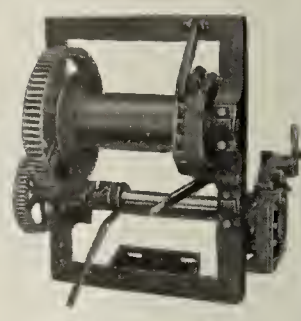
Write for Catalog
and Prices



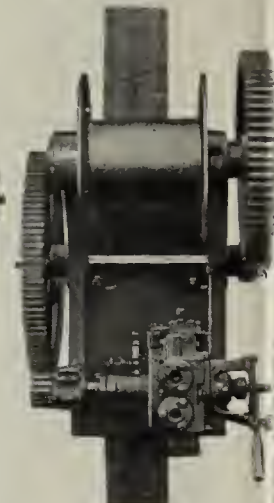
Swinging Engine



Double Drum Motor Crab



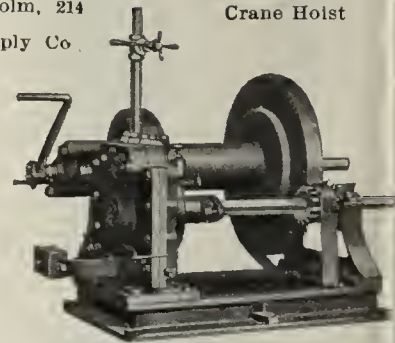
Single Drum Motor Crab



Crane Hoist



Direct-Connected Centrifugal Pump

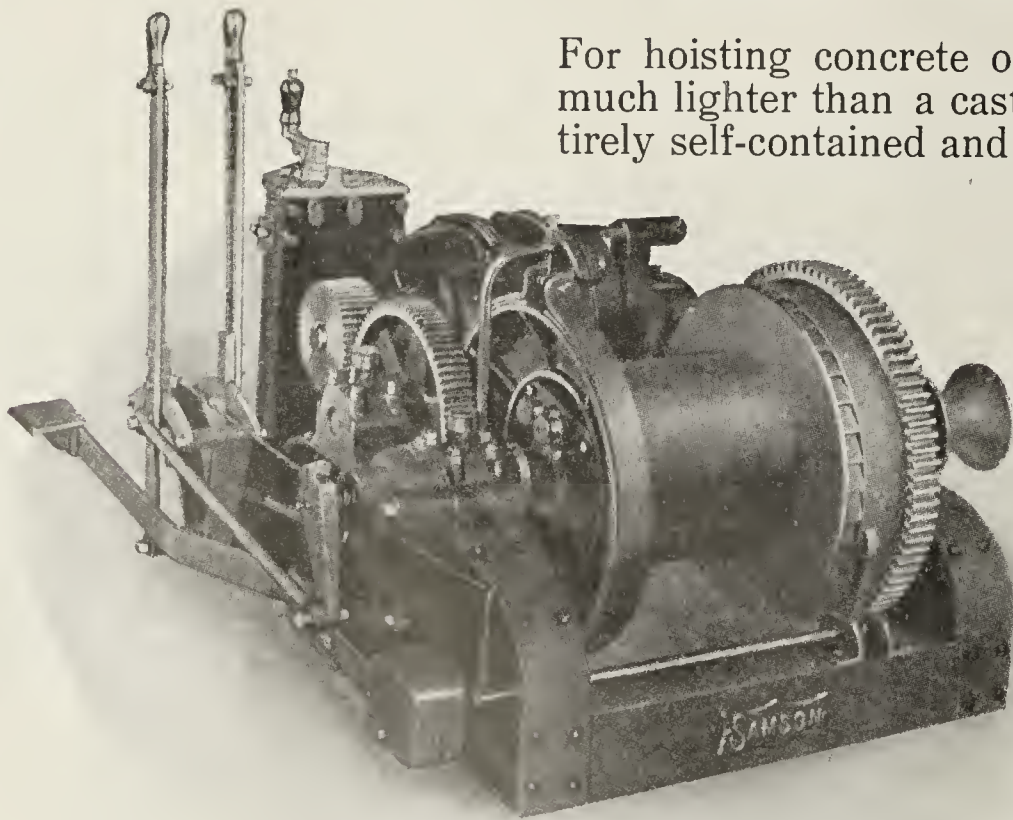


Single Drum Friction Hoist

AGENTS:
Boston—H. L. Bond Co.
New York—H. L. Drullard, 30
Church St.
Chicago—J. E. Chisholm, 214
Fisher Bldg.
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Cincinnati, Ohio.

Samson Single Friction Drum Electric Hoist

STEEL FRAME



For hoisting concrete our Steel Frame Hoist is the best. It is much lighter than a cast iron hoist and equally strong. It is entirely self-contained and easily moved.

Sheave Wheel on end of drum shaft for material elevators may be substituted for Winch Head.

Built Single Drum or Double Drum. This has proven a highly popular hoist with builders.

Lifting capacity 2500 pounds single line. Any rope speed required.

Furnished with either Direct Current or Alternating Current Motors.

Get our catalogue and prices before buying.

THE ENGLISH IRON WORKS COMPANY, KANSAS CITY, MO., U. S. A.



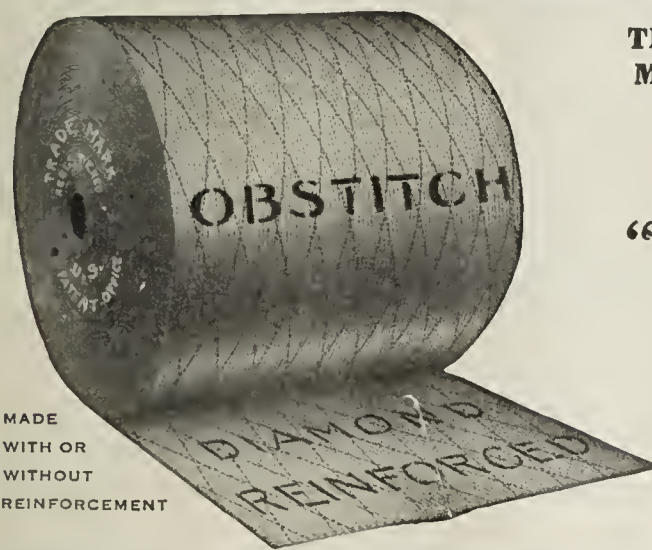
Supremo Conveyor Belt

Adapted for all general requirements such as conveying gravel, cement, clinkers, crushed stone, grain, clay, wood-pulp, salt, tailings, etc. It is far above the so-called standard belt, and one that has given general satisfaction under more than ordinary conditions.

There is a diversified list of uses for Conveyor Belting. We have carefully studied the different conditions and materials and stand ready to construct a belt for the duty to be imposed, which is often of an abusive character. Conveyors for hot cement, hot coke or slag, crushed stone, silica sand, etc., represent a few of the extreme cases.

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Revere Rubber Company
Chelsea, Mass.



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Pat. Office

With Patented Diamond
REINFORCEMENT

"THE BEST TEXTILE BELT IN THE WORLD"

For Cement Mills, Stone Crushers, Pulverizers,
Brick, Gypsum, Fertilizer Plants, and
General Transmission

MOUNT VERNON BELTING COMPANY

LICENSEES

327-333 WARREN AVENUE,

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Clyde Hydrator with Hood
"The Common Sense Way"

SIMPLICITY IS THE KEYNOTE OF SUCCESS

IT does not take a "master mind" to install a CLYDE Hydrating plant, nor does it take a "high priced" engineer to run one. If **YOU**, Mr. Lime Manufacturer, realized how simple it is to obtain a PERFECT HYDRATE, with the CLYDE HYDRATOR you would place your order with us by FIRST MAIL. Write us today—NOW, and let us explain to you what CLYDE PROCESS hydrated lime is and how to obtain the best results, then

Use your own judgment—it's up to you

H. MISCAMPBELL - Duluth, Minn.

Patentee and Sole Manufacturer

The Fuller Engineering Company

Designing, Constructing and Operating Engineers

Cement, Hydrated Lime and Gypsum Plants a Specialty

Reports, Examinations and Analyses of Raw Materials for Cement
Consultations Solicited.

Offices: Allentown Nat'l Bank Bldg.,

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F. W. FREEBORN Engineering Company

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ENGINEERING, DESIGNING AND CONSTRUCTING

Remodeling and Operation of
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**RIALTO BUILDING,
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LIME KILNS

HYDRATED LIME PLANTS

PORTLAND CEMENT PLANTS

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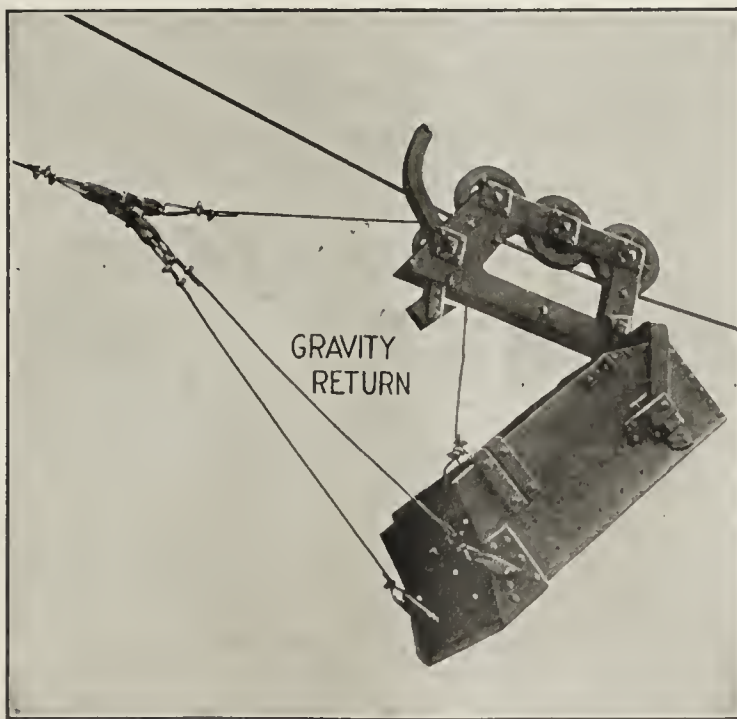
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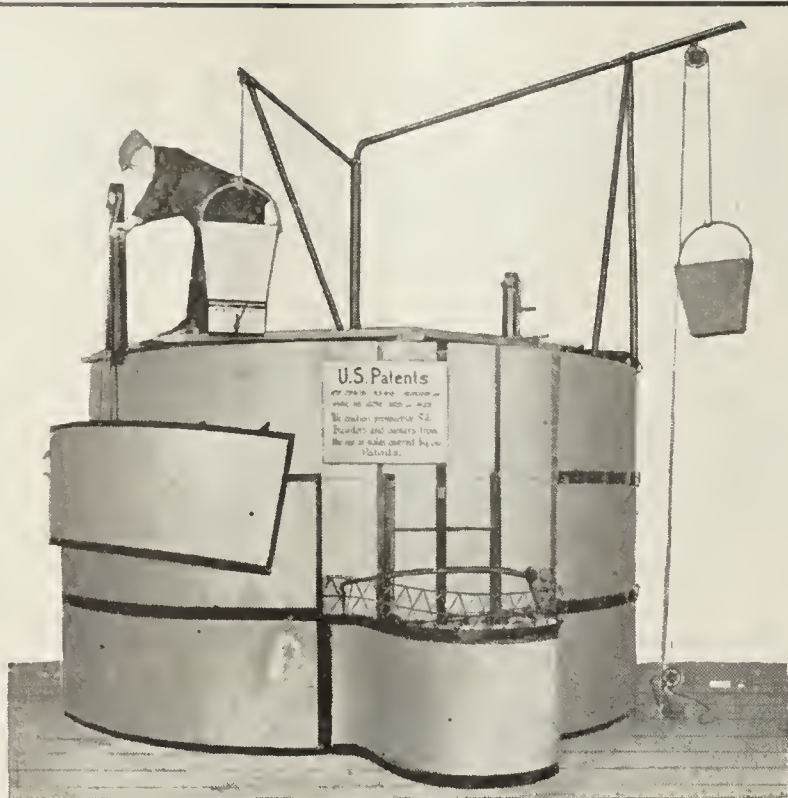
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CHICAGO, AUGUST, 1915

THE CEMENT INDUSTRY IMPROVING

The year 1915 opened with decidedly slack conditions in the cement industry, the latter part of 1914 having shown a large falling off in production and a still larger reduction in shipments of Portland cement than the corresponding period of the preceding year, as reported by E. F. Burchard, of the United States Geological Survey, and the net result for 1914 was a slight decrease in both production and shipments—the first yet recorded. The average price at the mills also decreased.

At the beginning of 1915 there was little new construction work in sight, few cement manufacturers felt optimistic concerning the outlook and some even prophesied a further decline in volume of business for 1915.

The general developments of the early months of 1915 were not such as to dispel the glooms from all of their lodging places, so that the rate of production of many mills was cut down below that of shipments in order to effect a partial clearance of the large stocks that had accumulated during 1914. In general, however, there has been an improvement during the second quarter of 1915, the rate of production of Portland cement having gradually increased, and although there are no statistics available for the first half year it is believed that, as compared with the corresponding period of 1914, no appreciable gain or loss has occurred. If this be true, then conditions really are better than were anticipated by the majority of producers at the beginning of the year, and, if no unforeseen conditions arise seriously to affect business, the next six months should show an improvement over the first half of the year.

The cement industry is particularly subject to local conditions, especially in inland districts, since cement is too bulky a product to be shipped in great quantities by rail into competitive territory, except under extraordinary circumstances. Naturally, therefore, certain districts, such as those that produce cotton, and those in which industrial agitation has recently checked progress, have felt the depression more keenly than

the average localities, while in districts where large public works are in progress, or where advantage is being taken of the apparently favorable prices of structural materials in order to push extensions of factories and new construction work, the production and shipments of cement have increased. Thus the conditions in the cement industry are in strong contrast between the Gulf States and the Rocky Mountain States on the one hand, and New York, Pennsylvania, Ohio, West Virginia and Michigan, on the other hand.

ORIGIN OF THE POLK SILO

Some eight years ago, Mr. Walter Polk, of Fort Branch, Indiana, was visiting a friend in Evansville, Ind. This friend was erecting a concrete smokestack and having a mighty hard time with it, experiencing the thousand and one difficulties that attend circular concrete construction, especially where altitude is necessary. Mr. Polk, seeing the difficulties, turned his inventive genius to the problem, and before long had contrived the Polk System of circular concrete construction.

Just at this time an admirable opportunity offered to try out the new invention. A resident of Fort Branch, Ind., had decided to build a circular steel grain storage bin. Mr. Polk persuaded him to have it built of concrete, and guaranteed the job. Erected by the new Polk machine, this concrete bin was an unqualified success.

The Polk System machines for circular monolithic concrete construction, which are now made by the Polk-Genung-Polk Co., Fort Branch, Ind., have been in use only about eight years, but already they are to be found in operation from New York to California, and from Montana to Eagle Pass in one direction, and to West Virginia in another.

The machines are fully covered by patents in the United States and Canada. The basic principle is that of a hollow steel mast guyed to a perpendicular from which the steel forms are suspended. A filling of 3 ft. 10 in. can be made every day. The highest circular concrete constructions in existence have been made by these machines, and there is practically no limit to the altitude attainable.

This is a splendid money-making proposition for the contractor. Many a contractor, tired of the urgent competition in ordinary building, has invested in one or more of these machines and made more money than he ever did before.

Cement and Engineering News readers will get next to an unusually profitable investment by writing to the Polk-Genung-Polk Co., Fort Branch, Ind., for their catalogue.

GOOD ROADS

A Talk by Richard Hardy, President Dixie Portland Cement Company

President Richard Hardy, of the Dixie Portland Cement Company, made one of the best informal talks heard at the Chattanooga Automobile Club dinner. His subject was "Good Roads." He contrasted the value of many kinds of roads which wear out long before the bonds are paid, with concrete roads that last for many years. He called attention to the great cost of upkeep necessitated by macadam and other styles of roads, and showed that this item is practically eliminated by proper construction of concrete roads. He cited Wayne county, Michigan, as a fine example of concrete road construction, saying that an elaborate system of roads to be built of concrete had been planned and that the people were already so favorably impressed with that construction and the benefits from improved roads that instead of clamoring against taxation for roads they were clamoring for more roads.

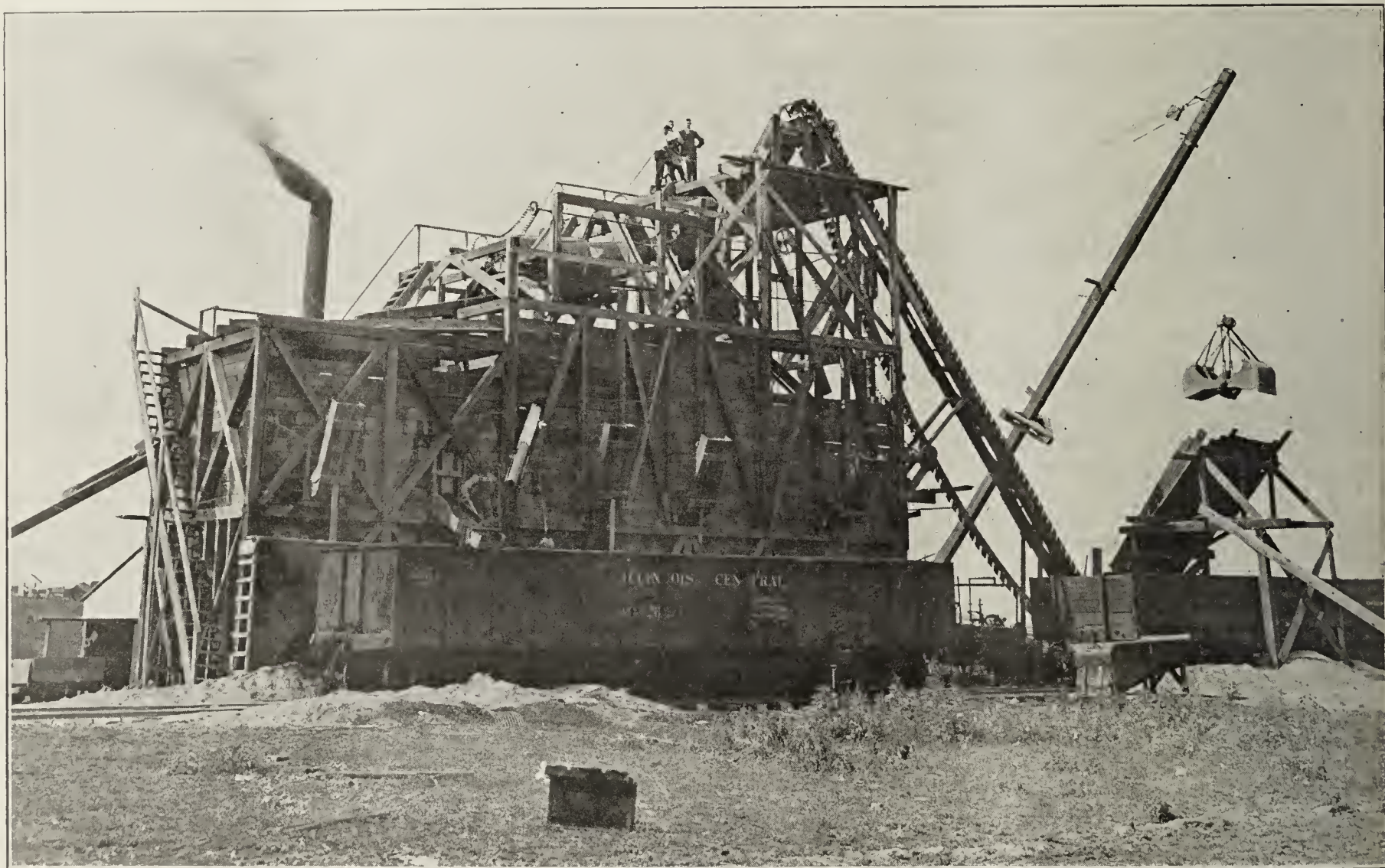
Economics of Concrete Construction

By DeWitt V. Moore*

Concrete is a peculiar building material in that it is manufactured on the job, whereas stone, brick, steel and wood are delivered on the site ready for installation into the structure. The cost of stone as delivered is determined by its quality and hardness and by the distance of transportation and the cost of quarrying and dressing. The cost of the brick as delivered is determined by the quality of the clay from which it is produced, the method of manufacture, the quality of the product, and the distance of transportation, and also by the cost of labor to handle, sort, and select. The cost of steel is more nearly consistent; but even this material is affected by the character of the material, the shapes into which it is rolled, the sizes of such shapes, and the distance of transportation. The

throughout the entire operation of mixing and placing. Broken stone is usually obtained from quarries, and must be transported by railroad cars, unloaded by hand, and then hauled to the location of the work. Gravel on the other hand, when loaded, is hauled directly to the site of the work. From a cost standpoint we have therefore two reasons why gravel is preferable: (1) Under ordinary conditions there is less manual labor connected with its delivery; (2) there is less cost for manual labor due to the nature of the material: a laborer can shovel approximately 20 per cent more gravel than stone under the same conditions.

If the gravel is good, the resulting work is equal to or better than broken stone concrete. A good gravel for concrete should be of varying sizes wherein the



Gravel Washing Plant of Cherokee Sand & Gravel Company, Cherokee, Iowa.

cost of timber is likewise affected by the character of the wood, the size of the pieces, the grade, and the distance of transportation.

In all of the foregoing standard building materials, no man would think of bidding without first ascertaining what was required, and then obtaining a price from those who were qualified to furnish the specified material. In the case of concrete, it would appear that the elements entering into its construction are in most cases entirely overlooked; that concrete is treated in the estimate without any regard to the varying character of materials and proportions entering into it. This is not as true now as it was a few years ago; but it is still true in a great many proposals.

Selection of Gravel or Stone. Most specifications allow either gravel or stone to be used. Where good gravel can be obtained, it is preferable to stone from a cost standpoint, and it is more easily handled

size of the pebbles ranges downward from, say, $2\frac{1}{2}$ in. to $\frac{1}{4}$ in. The proportions of sizes should be such that there is approximately 50 per cent of each size with reference to the next largest. Concrete made of such materials will be homogeneous, dense, and of great strength. Either gravel or stone should be watched very carefully for foreign materials, such as lumps of clay from stripping the hard-pan strata, sticks, decayed matter, etc. So-called yellow gravel is not necessarily a sign of weakness, although such a deposit should be carefully examined. Many times such a surface discoloration is caused by leechings from deposits or strata of oxide of iron or other minerals.

Selection of Sand. Much that has been said about gravel is true of sand, except that sand is in a sense more important than gravel. Sand should be relatively clean and of varying-sized grains. Such a sand is much better than when of even-sized particles, and I think I am safe in saying that silt up to 5 per cent

*From a paper read before the Indiana Engineering Society.

will not affect the strength of the resulting concrete. If, however, sand is silty to any such extent, care must be taken that the work is cleaned every morning (this same remark applies to the gravel); for if this is not done, there will arise to the surface of each day's work a soft, slimy substance which has no strength and which will form strata of demarcation between the successive courses. Other things being equal, it is better to import sand at an increased cost, using local gravel, than to use local sand and import gravel and stone.

Selection of Cement. At the present time there are so many brands of Portland cement of recognized value that, as far as quality and ability to withstand tests are concerned, there is little choice. When it comes to large and important work, however, it is well to consider the capacity of the plant and be sure of its ability to deliver the cement on time and in the quantity required.

Selection of Machinery. Various types of work naturally demand various types of machinery and arrangement; but in general it may be said that a small mixer is not economical. Use preferably nothing smaller than 18-cu. ft. mixer, which will deliver $\frac{1}{2}$ cu. yd. of mixed concrete, and use a larger mixture than this if the work will justify it. Also in general it may be stated that each batch from the mixer should be handled as a whole as nearly as possible to the place of deposit. The wheelbarrow is no longer the primary method of transportation of concrete. There is no doubt as to the majority of opinion being in favor of batch mixers; but whatever the type adopted, it would be well in the long run to install 20 to 25 per cent more boiler and machine power than is specified by the manufacturer.

When Hand Mixing is Justified. Hand mixing cannot be expected to be as uniform as machine mixing; and yet, if proper care is taken under intelligent supervision, good results can be secured. From the standpoint of cost, hand mixing is preferable, when the work is so small as not to justify the installation of a machine. For instance, on a job of a couple of hundred cubic yards, \$100 would probably be expended in installing and rigging the mixer, or a cost of 50 cts. per cu. yd.; and it is doubtful if hand mixing would cost any more than this difference. Again, hand mixing is preferable in connection with large work where, in order to reach isolated portions of the work, it is more economical to mix by hand than to wheel long distances. Hand mixing is most important when constructing floors, sidewalks, and pavements on a natural gravel foundation where it is possible to shovel material directly upon the mixing board, mix, and then shovel into place upon the opposite side. Under no circumstances can machine mixing compare in cost with this method where conditions will permit of its use.

Mixing Concrete. For ordinary work, concrete should be mixed wet, soupy. From the standpoints of quality, ease of handling and manipulation, resulting finish and cost of surfacing, there is absolutely no question as to this point. This choice of wet concrete applies to walls, bridges, reinforced concrete buildings, etc.; but for sidewalks and pavements, economy demands a dry mixture requiring tamping in order that the workmen applying the finish may follow as quickly as possible after the depositing of the concrete.

Placing Concrete. No concrete should be placed until it is definitely determined that the forms are correct and properly braced. It is cheaper to delay the work than to cut out work already done. Concrete should be placed as quickly as possible after mixing, and not be disturbed thereafter. The placing of concrete is one point where the material is abused to the greatest extent. We take great care of a green brick wall,

but do not hesitate to walk over and conduct operations over concrete which has not reached its final set, thereby destroying the surface of the concrete for all time. While this may not be serious in some cases, it is certainly not desirable in thin concrete slabs. Concrete is better placed by chutes than by wheelbarrows, cars, etc., for the reason that, by chuting, the material is constantly kept in the process of mixing until it is deposited in the work. With barrows or carts the heavier particles settle to the bottom; and when the mixture is dumped into the work, there is a separation. Chuting also allows the placing of the concrete with a minimum of working back and forth over the work just completed.

The ideal condition would be the completion of the work without interruption; but, as this cannot be attained, care should be taken in the location of and in the manner of constructing the connecting joints as the work progresses. Breaks should preferably be made at the center of slab spans and at the center of girders or over the center of columns transverse of girders. Slab spans may be jointed longitudinally over centers of girders or beams; but this method should be considered a second choice. Columns should not be poured all at one time. Generally a height of 4 ft. should be allowed to set for three or four hours before the second pouring. Slabs, girders, and beams should be poured continuously up to the determined joint where stop forms have been placed. The method of pouring girders up to the bottom of the slab, and then afterwards placing the slab, is not desirable. The method of pouring a slab and allowing the material to slope down over the girder and then beginning the next day, gives a slip-slab joint which cannot be recommended. In all concrete work, stops should be made on horizontal and perpendicular lines at locations mentioned, the forms being carefully placed.

Finish of Concrete. We are wrong in our present practice of finishing concrete surfaces. The surface finish of a piece of concrete should be an integral part of the main construction and of the same mixture and same composition. Time was when we were called upon to plaster and apply a surface coat to vertical surfaces. After a good many years of argument by the practical concrete workman, we have reached a point where such surfaces are generally finished by spading so as to bring the finer particles to the surface and force the large particles back so they are not exposed. We are, however, following the old practice in respect to horizontal surfaces, applying a thin coating of a rich mixture on top of our cheaper concrete base. In order to secure the best results, we should so manipulate our concrete as to bring our finish to the surface from the material of the concrete base. When we reach this point, we shall have less trouble with checking, insufficient bond, etc.; and such a finish can be easily obtained by the use of proper tools for tamping.

Construction of Forms and Centers. If there is one element entering into the cost of concrete which is neglected, it is the cost of forms and centers. So far as is known to the writer no architect or engineer ever submits to a bidder a plan for this part of the construction. Even the specifications are vague and indefinite, leaving it to the individual contractor to plan his own work. Some go to one extreme, and use a great deal more timber than is necessary; others to the other extreme, and use so little and of such light construction that the work is out of line and out of plumb. When it is considered that the cost of forms and centers represents from 20 to 33 $\frac{1}{3}$ per cent in the cost of every cubic yard of concrete placed, under average conditions, it is hard to understand why the subject is not given more consideration.

Ordinarily it is left to the carpenter boss to put up something by rule of thumb and by his judgment based on past experience. There is nothing practical about such a method. The designs for the forms of any structure should be carefully planned to accomplish the results with a minimum of material and labor, giving due consideration to the maximum amount of salvage in the material. It is our contention that, accompanying the plans for any structure, there should be prepared by the engineer and architect a sheet detail drawing showing how forms should be constructed, thereby insuring quality of workmanship and placing all bidders upon the same basis. If this is done, there is nothing to hinder any contractor from submitting an alternate design.

Types of Reinforcement. Types of reinforcement now on the market may be classified as follows: (1)

determined by the price submitted by the commercial engineers bidding under sub-contract to furnish the metal. To a certain extent this method is dangerous but it is hard to suggest a remedy. Individual preference and experience are always a very large element.

Placing Reinforcement. The design of a concrete structure contemplates the placing of the reinforcement in exactly the position shown by the plans and cross-sections of the various members. Designers are usually quite conservative in their allowance for protection of steel by fireproofing concrete below it; and the contractor had better err on the safe side and take advantage of this allowance, rather than keep above same. Many times reinforcement—and especially light bars, expanded metal, and wire fabric—are laid upon the forms, and then afterwards manipulated by a hook as the concrete is placed, jerking the re-



View of Gravel Pit of the M. J. Gilleas & Co., Cherokee, Iowa.

Plain bars, either medium or high-carbon steel; (2) plain bars, deformed or cold-worked to secure deformation: this classification includes cold-twisted and hot-twisted square bars; (3) special patented types of plain or deformed patented bars; (4) built-up bars, meaning thereby combination of various-sized members in order to utilize the quantity of steel to the best advantage; (5) built-up frames composed of bars of various sizes, generally used for beams, girders, and columns; (6) floor-slab reinforcement of sheet metal, sheared, punched, or expanded in order to distribute the steel through the mass, and delivered in sheets; (7) cold-woven wire similar to fencing material, delivered in rolls; (8) secondary reinforcement in the way of hoops or bands for columns, stirrups for beams, and spacers for rods, all which may be made of hoop iron or wire.

Selection of Reinforcement. Considering the various types of reinforcement just mentioned and the many modifications now on the market, it is a difficult proposition to select the best; and generally the selection is

inforcement upward so that the concrete may flow underneath. This is dangerous, inasmuch as there is no gauge to determine the final position of the reinforcement; and if the concrete flows under the reinforcement in too large a quantity, it is almost impossible to replace the reinforcement without rebuilding the entire work.

Automatic spacers and devices for the accurate placing of the steel are readily obtainable, and should be used. Naturally there is some increase of cost due to such a method; but it is money well expended. Especial care should be taken in placing steel in girders and beams, so to distribute and arrange the bars that each individual part may be incorporated within an individual part of the concrete. The reinforcement for columns should be accurately made, and wired with the hoops and stirrups in place before it is erected in place ready to build the column forms around it. While good results can be secured from bar reinforcement, the author is at this time in favor of built-up columns of light structural shapes, for the

reason that the integrity of the whole building depends upon the column construction, and a failure of any one column is liable to result in a failure of the entire building. Perhaps the most important reinforcing detail in respect to proper placing is top reinforcement

or reverse flexure bars. No matter what the designer may have in mind in theory, or how these bars are proportioned with reference to the main reinforcement at the center of the slab or beam, it is absolutely essential that these top bars be placed accurately and not disturbed thereafter. This is easier said than done. The main reinforcement is embedded in the solid concrete below the surface, and is protected from disturbance. The top reinforcement is close to the surface, where it is affected by the future operations, and also where the free ends project in case of a break at the joints in the progress of the work. These free ends, if jarred, will many times break the bond of the half-bar extending into the work. The placing of these stirrups is a task requiring very careful supervision; and this is one of the strong arguments for built-up sections wherein the stirrup shear members are rigidly connected. Finally, the employment of an expert mechanic or steel worker at increased wages over common labor is justified by the importance of his part of the work.

Proportions of Concrete. It is very usual to specify 1:2½:5 or 1:3:6 for the proportions of cement, sand, and gravel, for plain or monolithic concrete work; and the usual specification for reinforced concrete is 1 part cement, 2 parts sand, and 4 parts gravel, although some engineers specify a richer mixture for columns. Inasmuch as there still exists a general ignorance on this point whereby these specifications are understood as being 1:7½ or 1:9 or 1:6 respectively, it would seem best that the specifications should read that a mortar should be mixed of one part of cement to so many parts of sand, and this mortar should then be mixed with so many parts of the aggregate.

Proportions of Concrete for Strength. The ideal mixture of concrete assumes that the aggregate and mortar are mixed in such proportions that the most dense, solid, and homogeneous mass is secured. This result may be secured by expert engineering supervision; but in reality the good common sense of the expert concrete laborer may be depended upon. The artisan who is accustomed to handle concrete can determine, by the appearance of the concrete mixture and by working the mixture, whether he is securing the best results; and, after a long experience, the author is inclined to say that he would just as soon trust a practical common-sense laborer's opinion as to base his work upon the report of a so-called expert engineer.

Proportions of Concrete for the Cost. If a 1:2:6 mixture will satisfy the necessary strength required for construction, there is no necessity of specifying a 1:2:4 mixture, inasmuch as the first mixture will require approximately 1 bbl. per cubic yard, while the latter will require 1½ bbls.—a difference of at least 50 cts. per cubic yard in actual cost. Many times for footings and monolithic work, ¾ bbl. per cubic yard of concrete is all that is necessary. Why specify a rich mixture when one with a less amount of cement will answer the purpose? If the contractor is at all skilled in estimating, the extra cost will be included in his proposal.

Estimating after Proper Analysis. No proposals should be made upon a concrete job until a proper analysis has been made of all the elements entering into the concrete construction. It is not sufficient to say or to guess that the cost of a cubic yard is so much, but, instead, an analysis should be made of the

cost of a cubic yard of concrete under the conditions specified. There are a great many elements entering into the cost determined by such an estimate, which will be briefly stated in the following:

Cost of Materials. Depending upon whether the concrete is to be made of a natural mixture of gravel, or of stone and sand in various proportions, will depend the cost of the aggregate. The amount of cement depends upon the proportions of the concrete, as also do the amounts of gravel, stone, and sand. The cost of water for proper manipulation should not be overlooked. In cities the cost of water is determined by rates of 9 or 10 cts. per cubic yard. Outside of cities the cost depends upon the labor necessary to secure the water.

Cost Affected by Locality. Concrete work remote from populous centers cannot be done at the same price as when close to such centers, unless the work is so remote that a permanent camp can be constructed and the laborers held by the very remoteness of the work. Work that is at some distance from the point of supply must bear a charge for transportation, handling, and hauling of raw materials. This is a labor charge which is chargeable to material, inasmuch as the material should be considered as f. o. b. the job; but nevertheless the cost is increased per cubic yard in the proposal.

Cost Affected by Character of Labor and Character of Work. Good American labor will accomplish at least 50 per cent more per day than foreign labor. American labor, however, is scarce and preferential. American labor differentiates between clean-cut concrete work under favorable conditions and concrete work under adverse conditions, excessive water, and other disadvantages. The same work may cost a great deal more when built under favorable conditions than when built in town.

Cost of Work as Affected by Forms. A wall of concrete 27 ft. thick may be retained by the same forms and the same amount of form labor as are necessary for a wall 1 ft. thick. In the latter case the cost per cubic yard of concrete is 27 times as great. It is, therefore, not safe to estimate the cost of forms on a basis of guess price per cubic yard of concrete. Each individual job should be estimated for the amount of timber work as carefully as for any other item. It does not matter whether the cost is estimated on the basis of floor foot or concrete surface or upon a basis of feet board measure of lumber; the result is the same, inasmuch as this important branch of concrete construction receives individual consideration.

Cost of Work as Affected by Centers. There seems to be a misunderstanding as to the separation of forms and centers. Forms properly speaking consist of the timber work to form those members of concrete construction, such as columns, girders, etc., which must possess a certain regularity of form and evenness of outline. Centers, properly speaking, consist of timber supports for floor-slabs, bridge centers, etc. Where the great amount of labor on timber work is expended solely for the purpose of supporting the mass at a uniform or definite height, the unit cost is much less than for forming for individual members.

Cost of Work as Affected by Reinforcement. Fabricated reinforcement will cost much more delivered to the job than loose bars, but, on the other hand, will cost much less to place in position. It is needless to say that a job where reinforcement is made up of small bars less than ¾ in. will cost much more per ton for labor than for large sections. Good judgment must prevail in this particular. It is very seldom that an estimate will be made based on the labor and the tonnage of each size bar. Rather it is the practice to strike an average labor price in harmony with the class

of work to be encountered with reference to the different sizes of reinforcement. It is well to remember, however, that it takes practically as long for the steel man to place and wire a $\frac{3}{8}$ -in. bar as a $\frac{3}{4}$ -in. bar, while the tonnage is only one-fourth as great; and this point should be kept in mind in making an estimate.

Cost of Work as Affected by General Charge Items. There are a great many items of the cost of concrete work which are not included in the cost of materials, labor, forms and centers, reinforcement, etc. These costs consist of installing and removing machinery, coal, oil, repairs and fittings to machinery, general charge items such as rope and bolts, and the loss on petty tools such as shovels. Such costs may be determined on the basis of so much per cubic yard; or, preferably, they may be determined on the percentage of labor on different classes of work. No matter what the method of determination, the costs are real expenses, and are as justly chargeable as those for the gravel or cement entering into the work.

Summarized Detail Estimate of the Cost of One Yard of Concrete. In line with the foregoing remarks and the importance of the detail study of concrete, we submit the estimate for a cubic yard of concrete which according to specifications should be of a 1:2:4 mixture to be used for purpose of building construction; and making these estimates, we desire to lay emphasis on the fact that no two jobs cost the same when itemized in this way:

0.9 cu. yd. gravel at \$1.20.....	\$ 1.08
0.45 cu. yd. sand at \$1.00.....	.45
1½ bbls. of cement at \$1.20.....	1.80
Water	.10
200 ft. B. M. of lumber at \$20, used four times at 20 per cent less each time used, less 40 per cent salvage	1.08
Reinforcement, 150 lbs. per cu. yd., at 2½ cts...	3.75
Total cost of material.....	\$ 8.26
Labor concrete	2.00
Labor forms, 80 ft. B. M. at \$30.....	2.40
Labor centers, 120 ft. at \$20.....	2.40
Labor reinforcement, 150 lbs. at 1½ cts.....	.75
Total labor.....	\$ 7.55
General charge items, proportion of labor 15 per cent	\$ 1.13
Total actual cost 1 cu. yd. concrete.....	\$16.94

Each individual job that is encountered should be estimated in this same manner. It might not be necessary to throw the cost of forms and centers, reinforcement, etc., into the cost per cubic yard of concrete; but however the estimate is made, it should consider all these items, and in the end the result will be the same. If, in addition, there is to be applied a surface coat or finish, its cost must be added.

If there is any one item which adds to the cost, it is the form and center work. For instance, in the detail estimate just given, cost of lumber and form and center labor is \$5.88. If the work had been twice as heavy, the cost of this labor would only have been half as much per cubic yard. This should bring home to every estimator the importance of dealing with temporary structural timber work as a separate unit. Personally the writer would rather guess at the amount of reinforcement per cubic yard than guess at the cost of forms and centers. The cost of labor is dependent upon the amount of concrete placed on the square foot of area of work covered, inasmuch as the cost of placing depends upon the distance traveled and the amount handled. The greater the distance, the

less the quantity and the more cost per unit; and the less the haul, the greater the mass and the less the cost per unit. Such labor cost may reach anywhere to \$5 a yard; and it is suggested that a careful study be given each job to determine the amount of foot-pounds of work necessary to complete it.

Cost Records and Cost Accounting. It is suggested and recommended that each separate and distinct job should be given a detail cost recording in line with the foregoing, in order that the future work may be properly estimated. It is a very simple matter to arrange a cost record book with a system of time reports, so that such records may be obtained and recorded without increase in labor or cost.

THE MANUFACTURE OF SAND-LIME BRICK

By B. Sylvester, Calgary, Canada

Brick making dates back many centuries. Those of us who have or possess a copy of the book of books, the Bible, will find in Genesis that brick making was a known art in those early days. The children of Israel in 1706 B. C. made brick and they were found exceptionally good. Not only were they found good brick, but they were found good building material, for the Tower of Babel was built of them. So from those early days up to the present period brick has been the one staple building material. Bricks have been made in a large variety of sizes, from three inches thick by one foot square, and over, and they were also made like "Joseph's coat," of many colors, and are to the present day.

In those early days they used straw as a binder of material, the same as our plasterers use hair today in their lime mortar for the ordinary plastering work. In the early ages "time" was not of the same importance as it is today, for we are living in a considerably faster period, as time is money and those interested in the great industry of brick making experimented with material as well as machinery.

In burnt brick it was found that no kilns could be uniform in size, hardness or color. This was overcome first by Dr. Michaelis, of Germany, who experimented and in the year 1880 discovered the greatest of all inventions in the making of brick, the union of sand and lime and the hardening of them by steam. This process has grown in almost every country in the world. Improved since those early days of discovery, machinery has been made so as to save a great deal of time and cost and increase efficiency, until today sand-lime brick claims many advantages over any other building brick or other substitute for building purposes, such as being low in porosity, no disintegration, great crushing strength, improvement with age, absolute uniformity in size, two sides a finished face brick, no heat or cold conductivity, and can be made in colors to suit all requirements. The original color, resembling Indiana limestone (or sandstone), which were used exclusively in the building at St. Adresse, near Havre, in which the Belgian Minister of State has his offices, are in great demand.

The call for sand-lime brick has gone beyond the most sanguine expectations of the manufacturers. The product is the nearest perfect of all material. This has been brought about largely by the Sand-Lime Brick Association, which hold an annual convention at some city in Canada or the United States, yearly, where brick manufacture is discussed in all its aspects and everybody who has suggestions to offer on brick making do so at the round-table talks. It is essential that every brick manufacturer of sand-lime brick should be there for an interchange of ideas and suggestions.

The United States Government sends W. E. Emley, of the Department of Commerce and Labor and

Bureau of Standards, every year. He always reads a very valuable paper and answers all inquiries on tests made. I think that it was from his report of a year ago that we find the United States output of sand-lime brick was 174,361,000 brick.

There are now some 105 sand-lime brick yards operating in America. Architects are fast changing their views regarding these brick and are specifying them, not for backing up purposes, but for face-brick work. Contractors want them because of their absolute uniformity and freedom from warp. They are also easier to lay and require a good deal less mortar, and finally they are easier to handle.

The Chinese have recently put in a sand-lime brick plant, showing the up-to-dateness of this race and people, who ages ago built the great Chinese wall, 22 feet high and over 12 miles long, taking millions of men 10 years to complete the same.

The sand-lime brick industry in Canada is still in its infancy, but are made in Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia, and had the present times even been normal we would have seen many new plants installed this year.

One of the most important points in the manufacture of sand-lime brick is the securing of a good silicate sand; having this, then procure a suitable calcium lime (Magnesia lime is poor, harder to work, more difficult to mix and the bond is not so good; this applies to mortar also). Having found a suitable lime, it must be hydrated and pulverized very fine and then mixed in right proportions, usually about 6 per cent lime.

These brick are loaded on steel cars from the press as made and are run into long steel cylinders which are sealed up tight and subjected to a pressure of live steam of 125 pounds for 10 hours. Great care must be taken to keep this steam at an even temperature throughout to obtain a uniform color and hardness. These brick when cooled are ready for use.

INSIDE FACTS ABOUT STUCCO*

Troubles of Checking and Cracking Positively Preventable by Use of a Lean Mixture Combined With an Effective Waterproofing Compound.

The ease with which stucco lends itself to artistic treatment, has tended toward a precocious development that has been harmful. The trouble is that a stucco job which at first appears to be an artistic gem, gradually develops flaws which may finally overshadow the original beauty.

What is the cause of the "checking" and "hair-cracking"? Is it superficial, or is it hidden in the physico-chemical composition of cement? Much valuable study has been devoted to the external treatment of stucco, but few have stopped to question its internal composition. Let us therefore study some inside facts of stucco mortar.

The subject is an interesting one and the conclusions startling. Who would have thought, for instance, that cement acts like wood, swelling up on wetting, and contracting on drying? But this is proven by careful measurements.

A. T. Goldbeck, of the U. S. Department of Agriculture, showed this in experiments described in Engineering Record for July 8, 1911 (p. 45). His researches were confirmed by Prof. A. H. White, working independently in the University of Michigan, and were published in Engineering Record for July 15, 1911 (p. 73). Both of these gentlemen proved scientifically and conclusively that mortar and concrete expand on wetting and contract on drying, the action keeping up for years.

*By Ralph L. Shainwald, Jr., A. M., Manager, Impervite Waterproofing Dept., the Standard Paint Co., New York City.

In some cases the amount of expansion (due to wetting) was as great as that due to 100 degrees increase of temperature. This is a startling fact, when it is remembered that concrete expands with heat just as much as iron does. The strains due to wetting and drying are therefore very severe, and come quickly and repeatedly. It is not difficult to see why this should be such a serious source of cracking.

It is fortunate that only the cement is affected, the sand remaining practically uninfluenced by moisture. Therefore lean mortars are much less affected than rich ones; a 1:3 stucco when moistened expands much less than a 1:2. But, as Prof. White says, "If a stucco is lean enough to avoid cracks, water will go through freely, and if it is rich enough to keep water out, it will crack."

In Italy, where stuccos have been used for centuries, masonry walls were thick and waterproof in themselves. Cement was made from pulverized natural rock, and lean stucco mixtures were a matter of economy. The passage of ages has developed comparatively little checking in the Italian stuccos. But today, in America, Portland cement is cheap, walls are thin, and climate is severe, so that rich mixtures have been used in the attempt to get cheap waterproofing. The result is excessive hair-cracking.

It is, of course, true that a 1:2 stucco is more waterproof than a 1:3, but it is very much more liable to crack. On the other hand, a 1:3 stucco, properly applied, is safe from cracking, though very porous. This, then, is the dilemma which confronts the constructor: how to make stucco lean enough to avoid cracks, yet non-porous enough to keep out water. The problem has been solved by the use of a 1:3 mortar in conjunction with an effective waterproofing compound.

The leanness of the mortar prevents cracks, and the compound makes the mortar waterproof. This gives absolutely reliable results, both as to permanency of surface and permanency of waterproofing. It is in every way more satisfactory than asbestos or patented stuccos, which do not positively prevent checking and are never entirely waterproof.

Practical experience has corroborated the laboratory in showing the need for lean mixtures; but, as is frequently the case, we did not see the everyday facts in clear light until science opened our eyes. For instance, it has long been known that excessive troweling of a floor, etc., should be avoided. Now we understand that the troweling worked the particles of cement to the surface, making a rich mixture which cracked for the reasons above mentioned.

Some years ago an architect was building a stucco home for himself. The contractor ran short of cement and asked for permission to use a leaner mixture. This was permitted for the back of the house where it wouldn't be noticed, but the richer mortar was insisted on for the rest. To the surprise of everyone, the back wall is still flawless, while the front of the house is full of hair-cracks.

It must be emphasized that with a lean mortar the permanency of the waterproofing compound is a very important point, as the stucco is exposed to beating storms. That class of compound using stearates, oleates, resinates, or other soap material as a base, gradually washes out under prolonged action of water, which slowly but surely dissolves even stearate of lime. A permanently waterproof stucco is dependent on using a compound that is absolutely insoluble and unaffected by the elements. Bituminous waterproofing products belong to this class; and compounds have been developed which are miscible with water, yet become absolutely insoluble after the mortar has set. This result is obtained by emulsifying the bitumen, which then mixes with water as easily as milk does (milk is an

emulsion). But when the mortar sets, it de-emulsifies the bitumen, which then becomes as insoluble as a milk spot. (Butter is de-mulsified milk, and is not miscible with water.)

Bituminous materials so prepared give a very high degree of permanent waterproofing. They are absolutely unaffected by salt-air, brine, running water, boiling water, and ordinary chemicals. Weight for weight they give four times the efficiency of soap compounds, yet they actually strengthen the mortar instead of weakening it, and, because of the lack of all harmful action, the amount of compound is not limited to 2 per cent. If desired, 10 per cent or more may be incorporated in the mixture, and the waterproofing effect correspondingly increased. In this way a factor of safety may be secured which is as important in waterproofing as in other branches of engineering. It then becomes possible to waterproof under guarantee a cellar 50 feet below tide level, by means of a three-quarter-inch interior mortar facing. Evidently this is the kind of material which will give satisfaction also in external stuccos, where no pressure is encountered, but where, on account of the lean mixture, a safety factor is desirable to cover variations in mixing and plastering.

Bituminous materials also lubricate the mortar, enabling a very lean mixture to be troweled easily and compact. They also retard the too rapid drying-out of the stucco.

We might mention here that if new, green stucco is subjected to the rapid evaporation of hot summer days, great care must be taken to prevent premature drying-out. It must be remembered that the setting of Portland cement is a chemical reaction that requires time and moisture. Mortar will have no strength unless this set is obtained. As mortar dries, it shrinks. This shrinking puts a strain on the mortar which causes cracks if it comes before the cement has sufficient strength to withstand it. If, however, the stucco is kept moist for several days, by means of tarpaulins or fine spray, the cement will harden normally and become strong enough to withstand the strain caused by drying. Soap compounds should be avoided, as they delay the setting, thus causing the mortar to remain weak for a longer time. If stucco is made from a lean mortar, properly waterproofed, properly foundationed, and kept from premature drying, it may be allowed to harden without fear of immediate or subsequent cracking.

On large surfaces the thermal expansion should be considered, especially if the stucco is applied to a base having a different rate of expansion. It may be advisable to divide the surface into panels, having projections which add to the pleasing effect and facilitate the uniform application of the stucco.

The above outline calls attention to a few internal characteristics which are vital. Relieve the stucco of the disrupting strains caused by their disregard, and a worthy material is secured for the best ideals of architecture.

PERMANENT ROADS AND THE DIXIE HIGHWAY

Richard Hardy, vice-president of the Dixie Portland Cement Company and an ardent advocate of permanent roads, gives an interesting interview emphasizing the varied benefits to be derived from the construction of the Dixie highway and its branches sure to follow this development.

In the course of his investigation Mr. Hardy has made several interesting calculations. During the first year following the completion of the through course from the Great Lakes to the orange groves,

according to Mr. Hardy, not less than 5,000 parties will make the excursion, passing through Chattanooga either bound or en route north. The average cost per day for a party of four traveling in an automobile is \$20. Allowing twenty days for the trip, the expenditure, calculated upon this basis, totals an average for each party of \$400 spent en route. The expenditure of the individual parties multiplied by 5,000, the number of cars Mr. Hardy believes will make the trip during the first year, makes a showing of \$2,000,000 to be distributed through the South along the course of the great route. At this rate the highway will soon more than pay for the expenditure of its construction.

Another phase of the many benefits which Mr. Hardy declares will inure to the South as a direct result of the road development will be brought about by the interlacing system of roadways sure to follow the construction of the main artery. "Good roads," says Mr. Hardy, "are unquestionably the greatest commercial stimulators and civilization promoters known to man. An intricate system of good roads is certain to follow the construction of the Dixie highway, connecting valuable farm lands with their nearest absorbing center. This, of course, means the enhancement of farm values. Think of bringing produce direct from farms thirty to sixty or seventy miles from Chattanooga to the local grocers and market houses. A two-hour run in an auto truck will deposit the farmer's offerings in the heart of the city. Think of the reduced cost of living bound to ensue! Think of the tremendous advance in the value of farm lands. Why, the entire south will receive a stimulus that will create a new life and progress. Distance will be annihilated. I tell you, the real magnitude of the project now in hand is too big for the normal brain to grasp."

CONCRETE PILES

In the construction of the new Twelfth Street reinforced concrete viaduct at St. Louis, 2,000 concrete piles in lengths of from 25 to 35 ft. were placed in the foundation. Eight hundred and forty-four of the piles, 13½ in. square and 25 ft. long, were made in a yard some distance from the bridge and shipped by car to the job, but the remainder of the 2,000 were made on the job and hauled to the driver by means of a two-wheeled truck. Each pile contained four ¾-in. round bars placed in the four corners of the square pile and wrapped with a No. 8 wire on a 2-in. pitch. In wrapping the wire on the four bars a 3-in. pipe was used. This pipe had a crank on one end and ½x1-in. iron arms bolted at necessary intervals. These were of a length to hold the four rods at the proper distance. The pipe was laid in sockets on trestles. A leather strap was run around the bars at three places to hold them to the arms and then the pipe was revolved, winding the No. 8 wire from the spool to the bars. The wire was then tied to the bars at every third interval to hold the cage intact. Two men at 65 cents per hour and one man at 70 cents per hour made from 16 to 20 cages per day of eight hours.

Some piles were mixed by hand, but the majority were machine made. The mix was 1:2:4. The piles were not rolled under four days and not driven under thirty days. In mixing by hand the board was placed on top of the forms and the concrete shoveled directly into the forms. The cost of concreting by hand and by machine was practically the same, 8 cents per foot of pile, concrete labor being 40 cents per hour.

The work was done by the Fruin-Colnon Contracting Company, of St. Louis, under the general supervision of Winters Haydock, engineer for the city of St. Louis.

Prehistoric Monuments at Quirigua, Guatemala

By Neil M. Judd

Thirteen visible stone monuments with the ruins of surrounding temples, pyramids, and ceremonial courts are all that remain of a once powerful religious community, near the present station of Quirigua, Guatemala. Sixteen hundred years ago, if we may accept the figures of some students of Central American archeology, this empty city was active with the enthusiasm of its inhabitants; now the calls of jungle fowl echo through the enveloping silence.

In an effort to preserve this home of a prehistoric people, the United Fruit Company has recently created a reservation of seventy-two acres, thus separating from its enormous banana plantations, a ruin the very existence of which remained unknown until 1840. During that year Mr. John L. Stephens, bearing special messages from the United States Government to that of Guatemala, heard of the old city and sent his companion, Mr. F. Catherwood, to view the site. Mr. Catherwood's sketches, accompanying Mr. Stephens' descriptions introduced the Quirigua ruins to students of archaeology.

Forty-one years later, Mr. A. P. Maudslay, an English traveler, visited the ancient city. He secured hurried notes and photographs but returned for more detailed observations during each of the two following years and again in 1894. While continuing his investigations of 1883 and 1894, Mr. Maudslay secured paper squeezes and plaster piece-molds of several of the huge, carved stones for which Quirigua is so justly famous. Subsequent American expeditions added to Maudslay's list of molds, notes, and measurements but a systematic study of the Quirigua ruins had not been attempted, I believe, until Dr. Edgar L. Hewett, Director of the School of American Archaeology, began a series of excavations in January, 1910. With one exception, these excavations have been continued annually since that date and, during the expedition of the past winter, the most recent of that phase of the work which these paragraphs consider, the series, I was a chance associate, having in charge

As a former religious center of the Maya Indians, the old city of Quirigua consisted of a principal temple area, a large ceremonial court or plaza, and a number of associated temples and pyramids. The dwellings of its devotees were, supposedly, mere palm shelters scattered through the forest-covered valley for some distance beyond the priests' houses.

Mother Nature and all the little elements at her command have been working for generations in their attempt to erase evidence of man's invasion of the Quirigua jungle. Dripping water and swaying branches have cut and grooved the monument surfaces; earthquakes and growing plants have split and broken the heavy stones, thus destroying, to a greater or less extent, the lines and carvings with which they were all decorated. When Maudslay first visited Quirigua, in 1881, the ruins were almost hidden in the dense forest; the sculptured stones were over-grown with a mat of vines and moss in which even large trees had taken root. This growth was removed at that time for photographic purposes but, owing to the tropical environment, the cleaning had to be repeated when the School of American Archaeology began its work and again when the recent expedition commenced operations in January of the present year. The possibility of irreparable damage has rather hastened a realization of the necessity as well as desirability of reproducing these sculptures.

The stone monuments at Quirigua are of two types: tall stelæ or shafts, with human figures carved on both faces and hieroglyphic tables on the shorter sides, and low, zoöomorphic stones bearing similar inscriptions along the sides or front of the animal forms. Each stone was originally erected at the end of a Hotun or five-year period and its hieroglyphic inscriptions undoubtedly commemorated the important community events during that interval previous to the one in which the stone was raised. From an archaeological point of view, these monuments are valuable not only as examples of prehistoric American sculpture but also as records whose text may some day be intelligible to us and aid materially in broadening our meager knowledge of the people who conceived them.

Each monument was cut from a solid block of scoriaceous sandstone, that is, the stone consists mostly of volcanic scoria but also contains quantities of sand and coarse gravel. The action of the elements has loosened many exposed pebbles from their silica cement, thus adding small pittings to the already rough, granular surface and increasing the difficulties of mold-making by resisting all efforts to force an inflexible substance into perfect contact with the surface of the stone and by tenaciously gripping that substance, once it had been properly driven into position. For such a superficial texture, glue proved the ideal agent since the material of the molds was placed in a liquid condition and its natural elasticity, when hardened, permitted great distortion in removal.

Our process of mold-making was very simple. We began by building a light, plaster foundation around the base of the monument. This not only prevented the escape of the melted glue but also supported the superimposed forms which served as retaining walls for the glue molds. Above the foundation, a given section of the stone was covered with a layer of common clay mud, approximately one inch thick. Over this a carefully-jointed plaster form was built, of such dimensions as the breadth of the monument and the depth of its carving required. On the larger stones, the size of the forms was often limited by our ability to handle them—lacking mechanical means of moving heavy masses, we seldom made forms in excess of fifteen square feet.

During the construction of these forms, wooden braces were built into them and anchored with ties of fibre. Such supports increased the strength of the forms and, in addition, their extended ends proved a convenience in handling. Each form was completed, allowed to set, and its edges trimmed before an adjoining form was begun. Upon the completion of the four forms composing each section, all joints were secured with temporary ties of hemp and the working platforms raised for a second series.

In this manner the whole surface of the monument was covered and then, commencing with the topmost form, we began the real process of mold-making. One complete, horizontal section was lowered each day, the subjacent layer of clay thrown aside, and the exposed stone surface thoroughly scrubbed, to remove what mud and lichenous growth still adhered. While the stone was drying, all irregularities on the inside of the four forms were scraped off and the surfaces painted with a thick coat of clay-water, as an aid in separating form and glue mold.

At the same time, glue tubs were placed over hot-

water baths and their contents made ready for the daily pouring. That section of the monument to be reproduced and the inside surfaces of the waiting forms were thoroughly oiled with a composition composed of stearine, kerosine, and vaseline; the forms were raised to their original position and all joints were tied and covered with plaster and hemp. In their "original position," the forms were separated from the monument by an interstice equal to the thickness of the layer of clay over which they had been built. That space which the clay had occupied was later filled with melted glue. The thickness of the resulting glue molds, therefore, depended upon the thickness of the layer of clay they replaced. A section of the plaster form supported the back of each mold the face of which reproduced, in intaglio, the lines and carvings of the monument. From this counter-sunk, glue impression the cast was later taken.



The "Leaning Monument," 26 Feet Above Ground, Leans 13 Feet from Perpendicular.

Those receptacles in which the glue was melted were ordinary, galvanized iron wash tubs, secured from the United Fruit Company stores. Two sizes were employed, one containing the glue and a larger one in which the first tub might be placed, the two being separated by three or four small stones and a quantity of boiling water. The outer vessel rested upon metal rods or pointed stones, leaving space for a fire underneath; the water it contained was kept at boiling heat until the glue had thoroughly melted, after which it was ready for the forms.

Pouring the glue was a simple matter and required only a number of pails and men to pass them. Since

the normal glue mold shrunk considerably in solidifying, we increased the width of the forms by adding a low rim of plaster to the top of each section and, by filling this enlarged form with glue, secured a slight over-lapping of the glue molds. This enabled us to trim them flush with the original edge of their plaster forms and assured perfect joints when the casts should be finally assembled. Through those forms that inclined from the perpendicular, air-holes were drilled and later closed with clay as the liquid glue rising in the mold-space, began to flow from them. Improvised funnels were sometimes used in filling the glue-space, the weight of the liquid remaining in the funnel forcing possible air bubbles out of the glue molds and also counter-acting the effect of shrinkage along the upper edge of the mold.

Glue molds must be thoroughly cooled and hardened before plaster casts may be taken from them. To better obtain this condition, our molds were usually poured at sundown and left undisturbed until daylight. Then, as quickly as possible, the forms were lowered and the glue molds prepared for casting. Great care was taken to protect these molds from even the early-morning sun since only a few moments' exposure served to soften and melt-down the impression.

The surfaces of the glue molds were first dusted with French chalk to remove any adhering grease. After this a saturated alum solution was carefully brushed into every pore of the mold surface. On an average, one hour passed before this solution had completely evaporated but it always left a thin coating of alum that hardened the glue surface and protected it materially from the heat generated by the setting of the plaster composing the casts. This alum-hardened surface was painted with a thin stearine-kerosine oil previous to casting.

Our casts were made in the usual manner, that is, the face of each glue mold was covered with liquid plaster and this was added to until a desired thickness had been obtained. During the construction of the casts each was carefully re-enforced with wooden braces and hemp fibre to prevent warping and breaking.

Each horizontal section of the reproductions of the stelæ or upright monuments was composed of four parts, one for each side of the stone. These four parts, with their glue molds and supporting plaster forms, were usually bound together and braced from the inside before being separated from the glue molds. Since all plaster forms were constructed in conformation to the outline of the monument they reproduced, their corner joints were known to be exact, therefore, by carefully joining these forms and, while so joined, uniting the four parts of the cast they supported, the angles of the reproduction became as accurate as those of the original. Any other method would have required numerous measurements and much care in using them. Uniting the casts as we did necessitated, merely, uniform setting of the plaster on the four glue molds and a reasonable amount of speed in joining the casts. Even with our alum solution, the heat of the setting plaster soon melted the glue molds.

Each morning, as soon as the cast had been completed, attention was directed to preparations for the mold that was to follow. The forms were lowered from the next section on the monument and the stone prepared as indicated in preceding paragraphs. The glue molds just used were cut into small pieces and spread for drying; the forms were destroyed and carted into the jungle. It is interesting to note that melted glue, left in pails or tubs, would neither cool nor solidify but deteriorated within a few hours. Also, if the

drying fragments of the discarded glue mold were carelessly spread and a free circulation of air prevented, they invariably sweated and soured, rendering them unfit for further use.

Our party entered the field with no experience and but little knowledge of the use of glue molds. During such preliminary experiments as we could conduct,



Plaster Cast of a Death's Head from One of the Taller Monuments.

while awaiting the arrival of our materials, we learned that, in the tropics, glue or gelatin molds required more careful preparation than in the States. Our first pourings were too thin and resulted in soft rather sticky molds. It was soon apparent that a mere dampening of the dry glue flakes gave a thicker, heavier pouring and a more satisfactory mold than was possible with well-soaked gelatin. The impossibility of obtaining cool water for casting also brought its difficulties—speedy work was our only means of overcoming the resulting inconveniences. Another vexing problem was met with in the drying shed where minute worms developed a habit of exploring the interior of our plaster casts. Denatured alcohol, applied to the plaster seemingly increased their prodigious appetites for they continued to honey-comb the casts unless each reproduction was frequently exposed to the direct rays of the burning sun.

The climate was, of course, the greatest handicap under which the expedition labored. We reached Quirigua at the beginning of the dry season, a ninety-day period during which the rains are more irregular and of shorter duration than usual. Temperatures were distinctly tropical, a fact that only increased our trouble. Under such conditions, not only the nature of our medium but personal comfort as well required a temporary shelter over the monument being cast. Accordingly, canvas tarpaulins were drawn over poles that reached above the stones, drop curtains being utilized when driving rain-storms or the afternoon sun threatened the exposed parts of the monument.

During February, March, and April, the three months during which records are available, the average daily temperature, as observed on the shaded veranda of the nearest United Fruit Co. farmhouse, was 66° at 6 A. M.; 88° at 12 Noon; and 76° at 6 P. M. in the small, open space where our work of reproduction

was pursued, the temperature was obviously higher and more unbearable. The direct rays of the sun were unmerciful and the 150 foot wall of surrounding jungle successfully turned what occasional breezes would otherwise have freshened the plaza. A persistent, high humidity, added to this heat, was certainly a sufficient test as to the practicability of glue molds in the torrid zone.

For shipment, all casts were packed in wooden crates and protected by dried banana leaves. The fact that they survived the rough handling of Central American ports and reached New Orleans with very little breakage was owing to careful and generous reinforcement of the casts rather than abundant packing.

Our work was continued over a period of four months during which time casts were made of six colossal monuments. Each of these reproductions is an exact duplicate of its original and exhibits not only every line and carving of the primitive sculpture but the very texture of the stone itself. Compared with the results obtained by other processes, the casts from our glue molds are so vastly superior as to beggar description. The completed reproductions are to be installed at San Diego, California during the coming



A Cast from One of the Upper Sections of the Great Turtle.

Panama-California Exposition and later removed to the halls of the School of American Archæology at Sante Fé, New Mexico.

U. S. National Museum,
Washington, D. C.

The Plant of the Rockford Sand and Gravel Company

An interesting gravel washing plant is that of the Rockford Sand & Gravel Company, of Rockford, Illinois. This plant has been in operation for seven years and it has proven so profitable that additional equipment is constantly being added and its output is being increased every year.

In the main part of the plant there has been little change since its erection, and the accompanying photographs, taken several years ago, show the plant practically as it is today. The smaller of the three buildings, which is seen near the center of the picture, is the base of operations for the Lidgerwood drag line excavator. All material is received here and delivered onto an eighteen-inch belt conveyor, seventy feet centers, inclined at an angle of twenty and one-half degrees. This conveyor delivers to the crusher building, discharging directly into a screen, located at the upper part of this

in the first two years, all the gravel was excavated which could be reached by a ninety-degree swing of the conveyor. Due to the peculiar shape of the property, it was necessary to reach it in different ways. The frame of the portable conveyor was made up in fifteen-foot sections, so as to be easily adjusted to the requirement. The original length was 350 feet; it was increased to 550 feet and later to 650 feet. When the conveyor reached this length, it was swung over to a point centrally lined with the main conveyors in the building and another twenty-inch sectional belt conveyor was added, 650 feet centers, extending across the field at right angles to the first, onto which the Lidgerwood drag line steam excavator delivers the sand and gravel.

Arrangements have been made to still further increase the length of the first 650-foot conveyor as the



Fig. 1. The Lidgerwood Drag Line Excavator Depositing Gravel in the Movable Loading Hopper on the Movable Belt.



Fig. 2. Gravel Washing and Screening Plant of the Rockford Sand & Gravel Company.

building. This screen separates the material, discharging the "overs" to the Austin crusher; the crushed gravel and the "fines" from the screen pass into the twenty-four inch belt-conveyor, which is seen leading to the main screen house and bins. This conveyor is 200 feet centers, inclined also at an angle of twenty and one-half degrees. It delivers to the screen which washes and grades the gravel and delivers it to the bins below. Cars on each side of this building receive from the railroad spouts, some of which may be seen at the extreme right of Fig. 2.

The system of excavating and bringing the gravel to the plant is most worthy of note. As was already explained, the small building seen at the center of Fig. 2 is the base of operations. A long, horizontal twenty-inch conveyor, supported by a frame on skids, discharges always at this point, and under the original method of working the whole portable structure was swung around this building as a center. In this way,

excavation advances, as the property extends back for a considerable distance to the bank of the Rock River.

The method of operation is for the conveyor belt serving the Lidgerwood drag line excavator to be placed parallel to the cut being made at such a distance that, as the machine is swung, the bucket will discharge into a movable belt-feeding hopper.

The entire plant is located on the surface of the gravel deposit and the excavations must be made below this level to a depth of thirty-five feet. The Lidgerwood drag line excavator cuts a strip ninety feet in width and thirty-five feet deep. In operation the conveyor is placed in one position and the Lidgerwood drag line excavator is located about forty-five feet along parallel to the conveyor. When the Lidgerwood drag line excavator has worked out to the end of the conveyor, the conveyor is then moved sideways to a new position, and the Lidgerwood drag line ex-

vator is moved to its new location and the operation repeated.

This method of bringing the material to the plant, though not unusual, is nevertheless interesting, due to the distance that the material is conveyed by belt conveyors and to the great capacity and economy in handling. The level ground at this place and the fact that all cutting is made below the ground level, makes this system particularly adapted to this plant.

The plant produces thirty cars per day of the finest sand and gravel, which is shipped in large quantities into the territory within 100 miles radius.

The proper design of a sand and gravel plant involves the solution of many intricate problems and a careful selection of the machinery equipment. The Link Belt Company, Chicago and Philadelphia; The Jeffrey Mfg. Co., 914 No. Fourth street, Columbus, Ohio, and Austin Mfg. Co., Chicago and New York, N. Y., manufacture screens, conveyors, crushers, etc., for such plants and have their own engineers who design and superintend the construction of the buildings and equipment.

MEDUSA PRODUCTS ABROAD

The demand for Medusa White Portland Cement and Medusa Waterproofing, manufactured by the Sandusky Portland Cement Company, Sandusky, O., in foreign countries is very evident from the following shipments during June:

Three cars white cement to England, three cars to Cuba, two cars to Brazil, one car to Java, fifty barrels to Uruguay and twenty barrels to Portugal. One ton Medusa Waterproofing was forwarded to Argentina and one ton to Portugal.

From present indications these materials will soon be used in all the important cities of the world. Architects and engineers are realizing that Medusa products are necessary for satisfactory and permanent results.

THE ELEPHANT BUTTE DAM NOW NEARLY COMPLETED

The Elephant Butte Dam, which in many respects is the largest piece of work of this kind ever undertaken, is now practically completed. It is on the Rio Grande River, in New Mexico, and is being constructed by the U. S. Reclamation Service.

Actual construction work on this project began in 1911, at which time it was estimated that the dam could be finished in 1916. The accompanying illustration was made from a photograph taken the early part of this year and shows the condition of the work at that time.

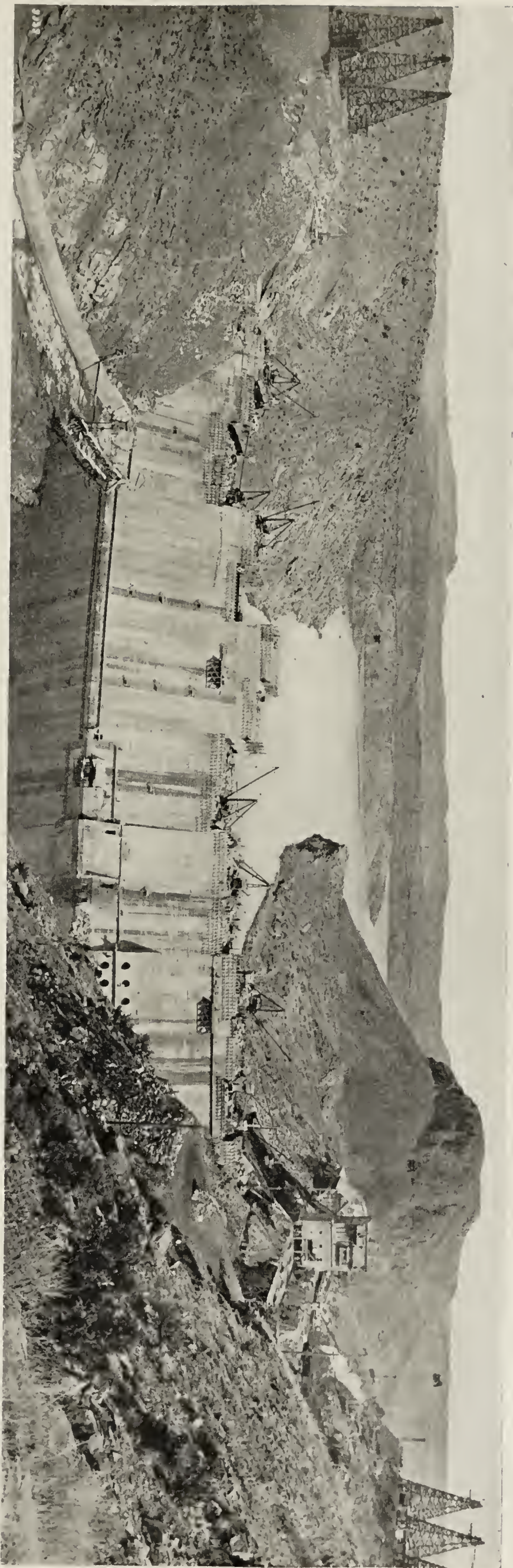
This dam is to be 265 feet high and will create a reservoir about forty miles long, from one to ten miles wide, and covering an area of approximately 40,000 acres. When full this reservoir will hold sufficient water to cover about 2,600,000 acres to a depth of one foot. It is estimated that over 180,000 acres will be irrigated by the water stored in this reservoir and that it will be distributed a distance of 150 miles.

As the Rio Grande River will deposit a large amount of silt each year in the reservoir, the dam is so designed that its height may be readily increased forty feet above its present elevation.

Three Lidgerwood Cableways have been used for excavating and transporting construction material. Off-leg derricks of 8-ton capacity are used to handle the material after it is delivered to the site by cableways.

Leschen Wire Rope has taken a very prominent part on this work from the very beginning. 2¼-inch Leschen Locked Wire Rope has given remarkable service as a main cableway line, and Hercules Wire Rope has been used almost entirely for operating lines of the cableways and derricks.

A General View of the Elephant Butte Dam. In the Distance Is the Elephant-Shaped Butte from Which the Project Takes Its Name.



Among The Cement Mills

ECONOMICAL QUARRYING OF LIMESTONE FOR USE IN THE MANUFACTURE OF PORTLAND CEMENT

By L. G. Sprague

In the operation of a Portland cement plant there is no division of the work more often neglected and consequently more frequently causing trouble because of a poor grade of cement resulting, than the department of raw materials. The economical mining of the raw materials, generally limestone and shale—though other calcareous (limey) and argillaceous (clayey) substances may be employed—depends both on a knowledge of the composition and other characteristics of the different strata dealt with, as well as on a thorough knowledge of efficient quarry methods. The writer has in mind a very large and costly cement mill that in a comparatively short time almost ruined the reputation of its output by changing the control and management of its quarries, accompanied by a failure to observe such matters as are emphasized in this article which follows by L. G. Sprague, chemist of the Virginia Portland Cement Company. In this connection it might be added that Mr. Sprague has made a special study of quarry problems and efficient quarry operation, particularly as related to the matter of chemical control, which is so absolutely necessary in the manufacture of Portland cement.

J. S. G.

The keen competition and resultant low prices of Portland cement, which have prevailed in this country since 1907, have compelled the manufacturer to reduce his cost of operation in every department by the use of improved methods. In no part of the process has this been more marked than in the quarrying and handling of the stone. The writer knows of an instance where the present cost of the stone, per ton, delivered at the plant is less than one-third the cost at the same place a few years ago. This is all the more remarkable when we consider that the laborer is receiving 15 to 25 per cent higher wages now than at that time.

To show some of the methods by which similar savings have been made under different conditions and to describe a successful method of quarrying limestone under certain specific conditions is the purpose of this article.

When Portland Cement was selling at a good profit to all, manufacturers' cost-keeping systems were not studied and planned as carefully as they are today. The old method was to get out the stone and figure the cost some time later, but the present efficient quarry superintendent knows quite definitely how many tons of stone he must deliver to the plant each day in order to keep his cost within a certain prescribed limit. Then the actual cost of operation per ton of stone delivered to the plant is accurately figured at the end of each month from the daily reports. This accurate account of costs with a certain definite and prearranged cost per ton set as a mark for the quarry superintendent to attain and a bonus to him at the end of each month for all that he cuts the cost below this mark will probably do more toward reducing the cost of operation than improved machinery. Of course,

this will only hold true when the quarry superintendent puts his subordinates on a similar merit and piece-rate basis and the quarry and plant conditions are such that the stone must be broken up, sorted and loaded on cars by hand.

In places where the deposit of stone is very thick and of a uniform composition, great savings have been made by drilling the entire depth of the deposit with large drills and blasting down the whole face of the quarry at one time, instead of the twelve to sixteen-foot section necessary under other conditions. Then the large and small pieces of stone are loaded by a powerful steam shovel upon the specially designed cars and taken to the monster crusher. This blasting in large quantities and the use of powerful handling and crushing machinery cuts the cost of labor to a minimum and is applicable to any quarry where it is necessary to select or separate the stone; but we know that stone to be suitable for the manufacture of Portland cement must be fairly uniform in composition and free from detrimental impurities.

Since such ideal quarrying conditions are very rare we will select for our detailed description the following conditions: A massively stratified crystalline limestone, each stratum having its own peculiar physical and chemical characteristics. These strata have about 45 degrees dip in general conformity with the mountain side from which they are quarried. Beginning at the top, these strata have the following thickness and approximate composition: (No. 1.) From ten to fifty feet of a dark cherty limestone, not suitable for cement manufacture and must be discarded: (No. 2.) Sixty to seventy-five feet of light grey 98 per cent pure limestone: (No. 3.) Two to fifteen feet of very dark impure limestone, which is nearly a Portland cement mixture, except that it carries too much magnesia to be used independently: (No. 4.) Twenty to thirty feet of light grey 92 per cent pure calcium carbonate: (No. 5.) Twelve to twenty feet of a very hard siliceous dolomite, entirely unsuitable for the manufacture of cement: (No. 6.) Ten to fifteen feet of dark grey stone containing 80 per cent calcium carbonate which cannot be used separately on account of the high magnesia content: (No. 7.) Twenty-five to thirty feet of 90 per cent pure grey limestone. Given these seven distinct strata, two of which cannot be used and two that must be carefully mixed with the very pure stone to make it suitable for use, and have all of these strata frequently intersected by large cracks and crevasses that are filled with a residual red clay which cannot be used and you will realize how necessary it is to have all of this stone loaded by hand and carefully selected in order to manufacture a first class cement.

The first quarrying operation is to remove the overburden of timber, clay and cherty rock. The timber generally pays for its own removal. The clay is removed either by pick and shovel, by small dump scrapers and horses or by washing it off with a high pressure pump and hose, depending entirely upon the quantity and the position it occupies. The cherty stone is drilled and blasted down in the same manner as the good stone and is either hauled away with the clay or crushed and used in concreting or for railroad ballast. In either case the cost of removing the material which cannot be used in cement manufacture greatly exceeds the amount realized from the part used for other purposes and this balance must necessarily be charged to the cost per ton of the good stone. This should be kept

in mind when selecting a quarry site and the quantity of waste material kept at a minimum.

The principal divisions of quarrying are drilling, blasting and removing the stone. The drilling is done with compressed air drills, with steel bits one and one-half inches in diameter and two to sixteen feet in length. That is to say the feeding arrangement of the drill is only two feet long, which necessitates changing bits when each two feet is drilled. The compressed air is furnished at one hundred pounds per square inch pressure. All holes are drilled vertically, or nearly so, except at the bottom of the quarry where they are often driven horizontally. These are often "toe" or "snake" holes. To set up the drill for these perpendicular holes, small notches are cut in the rock in which to place the points of the tripod legs. These carry heavy weights to hold the tripod in place and overcome the vibration of the piston which drives the drill. If the dip of the rock surface is too great, the drill is held in place by a heavy rope attached to a tree or stump above it.

Beginning at the top ledge, a row of holes is drilled parallel to the face of the ledge. The depth to which these holes are driven depends upon the thickness of the stratum, sixteen feet being the maximum practical depth with this size drill, or to the lower boundary seam of the stratum if it is less than sixteen feet. The distance this row of holes is placed from the face of the ledge is called the "burden" of the shot and is governed by the quality of the rock, the proximity of cracks or seams, the size and depth of the holes and the kind of explosives to be used. If the rock is very hard and free from cracks, the heavier the burden, within the limit of the strength of the explosive, the better it will break up the rock. If the burden is made too heavy, the rock is soft or the holes near a seam, the explosives will merely "blow out" around the holes and not break up or dislodge the rock between them and the face of the ledge. If the burden is too light, the explosive will tend to pick up the whole mass and set it out in a few large pieces which must be again drilled and blasted to workable size. Either of these conditions greatly increase the cost of drilling and blasting, but they seldom happen with the experienced quarryman who studies his conditions.

The spacing of the holes in the row is governed by these same conditions and is decided by the quarry foreman who must make a careful study of the peculiarities of each shot. After each hole is put down the proper depth and the loose material blown out of it with the air hose, it is plugged with a piece of wood or burlap to prevent dirt or pieces of rock getting in it. When the battery of holes is completed, we are ready to dislodge and break up the surrounding rock. This is called "making a shot" by quarrymen and the placing of the explosive in the holes is called "loading" them.

The kind of explosive used is that which has proved to be most effective and economical in this particular kind of rock. It is always some form of dynamite in hard solid rock, and considerable saving is made by conducting careful tests of the different brands, strength and sizes, selecting that which gives good results at the lowest cost per ton of stone. After a few of the most suitable kinds have been determined by these tests, it is well to get competitive bids from the different firms for the year's supply. In the particular case here cited, it has been found most economical to use 60 per cent dynamite, put up in cylindrical sticks one and one-half inches in diameter and eight inches long, manufactured by the Du Pont Powder Co., Wilmington, Del.

The manner in which this dynamite is placed in the holes depends upon the condition of the hole, quality of the rock and shape of burden. If the hole is rough and irregular, the dynamite is taken out of its paper wrapping and poured in the hole in bulk. If the rock is hard and solid or the lower part of the burden is thicker than the upper, the dynamite is packed tightly in the lower half of the hole. Otherwise, it is not tamped and may come within four feet of the top of the hole. The space above the dynamite is filled with water or loose dirt to make it air tight. This is known as the "collar."

About midway in the column of dynamite is placed a percussion cap or "exploder," which is connected to two insulated wires in such a manner that an electric current passing through causes a spark which ignites the "exploder" and sets off the dynamite. These wires or "leads" from the battery of holes are connected in series to main "leads" extending to a safe place and connected to the "exploder box." This is a small electric generator in a wood box, and is operated by a sudden thrust of a geared plunger. This sets off the dynamite simultaneously in all the holes. If the operations described above have been properly carried out, this explosion will throw the stone to the quarry floor broken up so well that it will require very little labor to break it small enough for a man to lift into the small cars for transportation to the crusher. If there are any pieces too large to be easily broken with a heavy hammer, the foreman breaks them with a "dobey" or "mud cap." This is a small charge of dynamite placed on top of the rock and covered tightly with about three inches of wet sticky clay, which throws the force of the explosion down sufficiently to break the rock in small pieces.

This stone is loaded into two ton capacity dump cars, which run on a two-foot gauge track. These are hauled to the plant by small steam locomotives where the cars containing the different grades of stone are mixed in the required proportion and sent to the crushers.

In order to obtain this proper proportion of the different grades, the quarry superintendent must so plan his operations that he can deliver some of each grade of stone to the plant at all times, and his constant co-operation with the chemist is essential to economical handling of this stone. Without this careful grading and mixing, it would be necessary to discard ledges No. 3 and No. 6, which would greatly increase the cost of operation.

In keeping the cost accounts, the charges in each department are divided into those for labor, supplies, repairs and betterments, with a distinct account for dynamite, from which the total cost of operation per ton of stone delivered to the plant is obtainable at any time. To obtain the actual cost to the company, a fixed charge per ton must be added to cover the original cost of the property. To be able to make this on a tonnage basis, one must have careful and accurate estimates on the total number of tons of acceptable stone in the property. These are obtained by thorough prospecting.

CHIEF CHEMIST, NEBRASKA CEMENT COMPANY

William A. Hopkins has resigned as chemist at the Security Cement & Lime Co., plant No. 1, at Hagerstown, Md., and has accepted the position of chief chemist at the plant of the Nebraska Portland Cement Co., Omaha, Neb. The new plant at Superior is said to have a capacity of 2,000 bbls. per day, with an unlimited supply of limestone and shale.

Among The Cement Mills

ATMOSPHERE HINDERS SHIPMENT OF CEMENT

Mr. McCurdy, sales agent, Southwestern Portland Cement Co., El Paso, Tex., said the atmospheric conditions existing in Texas work to a disadvantage in the handling of large shipments of cement. He declared the commodity draws heavily of moisture, and for that reason small shipments are desired.

"Mr. McCurdy," interrogated Judge Garwood, "is it not a fact that the moisture and humidity is greater in Orgeon than it is in your particular section of Texas?"

"Yes, sir, I believe it is," replied the witness.

"Well, then, you admit that El Paso is a dry country. Isn't it reasonable to assume that cement would not draw moisture to the extent in the El Paso climate as it will in the Oregon climate, yet the minimum carload weight on cement in Oregon is 38,000 pounds. How do you account for that? Is it reasonable, then, to make rates on climatic conditions?" asked Judge Garwood.

Mr. McCurdy smiled.

Chairman Mayfield suggested a minimum of 38,000 pounds might be adopted by the commission, and should the shipper desire to ship less, a second minimum of 24,000 pounds might be provided for. The first minimum, he believed, should carry the present 23 per cent rate and the second minimum carry an increase of 10 per cent. Mr. McCurdy said he believed the proposal to be a fair one, and Mr. West and Mr. Waldo concurred in the suggestion as a reasonable one.

All during the discussion of the cement rate, Chairman Mayfield strived to bring about a fair and equitable adjustment. He expressed the opinion that the present minimum of 24,000 pounds does not half load a car and for that reason is not sufficient. He also believed that something should be done to protect the small dealer, and the plan finally suggested by him apparently met with the approval of all concerned.

C. Bomberger, president San Antonio Portland Cement Co., of San Antonio, said the Dallas cement plants have the advantage over him in rates. He and

others expressed the belief that the Dallas plants receive a protective rate from the railroads.

Mr. Waldo, in answer to a question from Chairman Mayfield, said that he thought the special rate given the Dallas plants by the Texas & Pacific was done for the purpose of preventing the movement being placed in the Dallas switching limits. He said he believed the fear ungrounded. The chairman agreed.

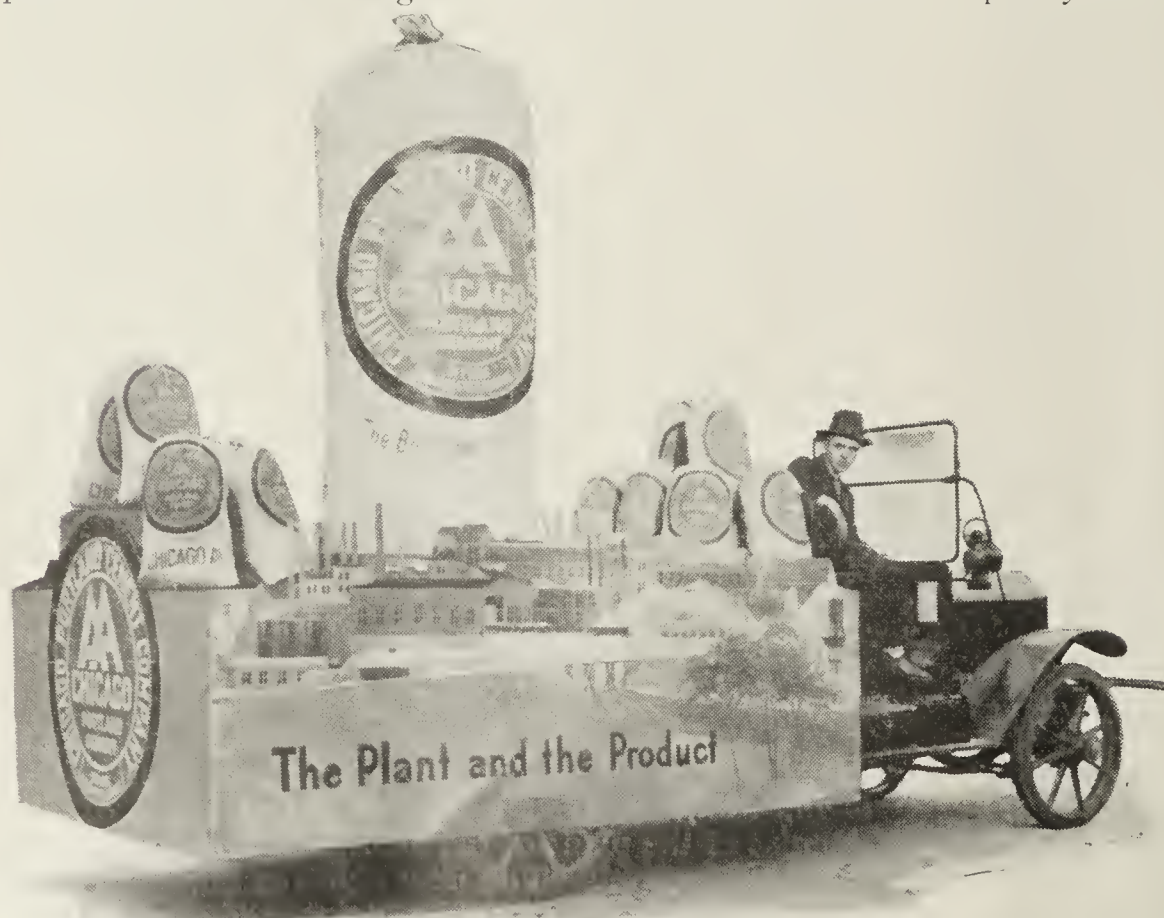
Grant S. Maxwell of Dallas objected to the explanation made by the Sunset-Central man, which brought about the explanation from Chairman Mayfield that Mr. Waldo was simply answering a question he had asked.

Horace Booth, traffic manager of the International & Great Northern, was called upon to explain charge made by Mr. Bomberger relative to a special rate made by his railroad covering the cement movement from Mr. Bomberger's mills to San Antonio.

Just prior to the noon recess the hearing took on the air of a deep water convention. C. E. Waldor and E. F. Ferguson, City Attorney of Beaumont, argued for the same rate on cement to Beaumont that is enjoyed by Houston and Galveston. They told of the wharf facilities at Port Arthur and Beaumont, and argued that these facilities are better than Houston has to offer. Their contention brought on considerable discussion, participated in by the attorneys for the carriers and a number of traffic men. Mr. Maxwell pleaded recognition for Dallas as a deep water port and held that the ship yards at Dallas entitled recognition. Neither H. H. Haines of Galveston or J. W. Wilkinson of Houston, participated in the banterings.—[Dallas, Tex., News.]

FORT DODGE CEMENT COMPANY

At the recent annual meeting of the Fort Dodge Portland Cement Corporation, Fort Dodge, Ia., the following officers and directors were elected for the coming year: M. J. Nicholson, president; L. H. Van Alstine, vice-president; H. S. Van Alstine, secretary and treasurer; T. A. Mair, general manager. The new plant of the company, which cost about \$650,000, will be completed in August and will have a daily capacity of 1,500 bbls.



Float exhibited by the Chicago Portland Cement Company in the pageant of the Associated Advertising Clubs of the World June 21, 1915, in Chicago.

The float showed their plant reproduced in papier mache. The windows were lighted by electricity, and reflectors concealed in the pyramids of sacks at the ends lighted the large sack in center.

CEMENT SPECIFICATIONS

The Sectional Committee on Cement, presided over by Sir William Matthews, K.C.M.G., was formed in 1903, and the first report was approved by the Main Engineering Standards Committee and issued in 1904. The specification has been revised from time to time with a view to improvement in the quality of the cement, and the new edition of "The British Standard Specifications for Portland Cement," just published, contains further important modifications.

Increased fineness of grinding of cement has been legislated for, and the minimum tensile strength at seven days of both neat cement and cement and sand has been raised. The clauses dealing with the preparation of the briquettes have been amplified, the procedure being described in greater detail than has previously been done. In the case of both neat cement briquettes and cement and sand briquettes ramming or hammering is expressly prohibited.

The growth of tensile strength at twenty-eight days both for neat cement and cement and sand is now given in the form of a formula in place of the fixed percentages which have been specified hitherto. While not making any material alterations to the figures previously laid down for the growth of the tensile strength of twenty-eight days over that at seven days, the formula gives a progressive increase instead of the somewhat irregular steps of the method previously adopted, and for use in the test-house lends itself to the construction of a curve from which the breaking strength at twenty-eight days corresponding to any ascertained breaking strength at seven days could readily be read off.

With the view of making easier the determination of what constitutes a visible impression in the test for final setting time the Vicat needle for this test is provided with a fixed metal circular cutting edge set half a millimetre back from the point as this length is sufficient to clear the scum which sometimes forms on the surface of the pat. The cement is considered to be finally set when the needle makes an impression on the pat and the attachment fails to do so. The attachment is illustrated on the plate showing the Vicat needle.

All the plates have been entirely re-drawn, and two new plates have been added to the specification, one dealing with a standard spatula for use in making up the cement and sand briquettes, and the other showing an improved form of specific gravity bottle, which the committee have approved as suitable for use, though they do not stipulate for its employment to the exclusion of any other pattern.

SUPERINTENDENT OF CHICAGO PORTLAND CEMENT PLANT DIES

Herbert S. Turner, general superintendent of the Chicago Portland Cement Company, passed away at the home of his brother, William Turner, July 6. His death was due to heart failure.

Mr. Turner was born in Philadelphia thirty-eight years ago, where he grew to manhood. He was educated in the schools of that city, and took a course in chemical engineering.

He was married about sixteen years ago, and soon after accepted a position with the Chicago Portland Cement Company here, and has made his home in La Salle, Ill., ever since.

After serving as chemist for several years, he was promoted to the position of assistant superintendent, which position he held until about three years ago, when, on the death of Mr. Drummond, who was then superintendent, he was appointed to the office he held up to the time of his death.

SIR SANFORD FLEMING DEAD

Sir Sanford Fleming, K. C. M. G., died at Halifax, N. S., on July 22, at the age of eighty-eight. He was Canada's great engineer and without doubt the greatest advocate of the uses of Portland Cement in the Dominion. He was for many years President of the International Portland Cement Company, Limited, Ottawa, Ont., President of the Western Canada Cement & Coal Company, Limited, Exshaw, Alta., and until 1911 Hon. President of the Canada Cement Company, Limited. He was associated with Mr. J. S. Irvin in the Portland Cement industry for nearly fourteen years and was a tower of strength for the industry in Canada. J. S. Irvin, President, International Portland Cement Company, Spokane, Wash., writes us as follows:

The death of Sir Sandford Fleming, K. C. M. G., removes from our midst a most distinguished citizen, philanthropist, and unique figure in Canadian history. His long life of useful activity is gemmed with good deeds and is an object lesson hard to imitate. About fourteen years ago I had the good fortune to become associated with him in business and through the succeeding years had the opportunity to know him as few men could. He was the grandest combination of heart and brain I ever knew. He was a friend of justice, an enemy of wrong doing and his greatest weapon was kindness.

His home life was beautiful. For many years he was both father and mother. True and constant as the polar star.

Many young men are indebted to Sir Sandford Fleming for their education and start in life's highway.

He was a friend of the poor and hundreds who have felt the touch of his helping hand will mourn his loss. Now that his life's work is done we can truly say "well done."

CEMENT MANUFACTURERS TO BUILD ROAD

The cement industries of eastern Pennsylvania and public-spirited citizens in Lehigh and Northampton counties have entered into an agreement with the state highway department to furnish sufficient cement to build a road twelve miles in length, running from Allentown to Bethlehem and continuing to Easton. According to the estimates of the state highway department, this will require upwards of 40,000 barrels of cement. Plans are under way also to have these citizens furnish, in addition, the amount of stone which will be necessary to construct this improved highway. A conference was held in the office of State Highway Commissioner Cunningham at which Col. H. E. Trexler, Congressman H. J. Steele, H. R. Fehr, president of the Lehigh Valley Transit Company; G. S. Brown, president of the Alpha Portland Cement Company; William B. Myers, representing the Bethlehem Steel Company, and Senator Horace W. Schantz presented the offer of the Associated Cement Companies and the citizens of that district. The proposition was made that the state highway department do the necessary grading and pay the expenses of such engineering changes as might be necessary, and build the road. The Lehigh Valley Transit Company pledged itself to furnish \$1,000 worth of transportation for the freight-ing of the cement.

CONTRACT LET FOR FURNISHING CEMENT

State Engineer Lewis, of Orgeon, has awarded a contract to the Standard Portland Cement Corporation, of San Francisco, for the furnishing of approximately 5,000 barrels of cement at Steinman, Oregon, at \$2.51 per barrel and an allowance of 10 cents per sack.

PROFITS IN THE DRAIN-TILE BUSINESS

Concrete drain-tile offer one of the greatest money-making possibilities of the century. It is said that in no other legitimate business that compares with this in the field of opportunity offered today, is there a greater demand for the product, or are the profits so certain, or the relative initial investment so small. These opportunities are open to the beginner with small capital, as well as to those already established in the concrete business.

For farmers must have drain-tile—and they prefer cement tile to clay. The cement tile man, in fair and open competition, can undersell clay tile, because he pays no high freight rates or dealers' commissions. His business is transacted directly with the consumer.

The Dunn "Automatic" tile machine has just been brought out. From mixing the concrete to making the finished tile, the operation is entirely automatic. Here's the process:

The concrete is discharged from mixer into lower hopper. A slide arrangement permits a required amount of material to be fed into the boot, and from there conveyed into top hopper by an endless-chain bucket-conveyor. From there it drops (without "arching") into the automatic feeder which fills the empty casing that has been automatically placed in position to receive it. At this instant the packer-head rises from below, packing the bottom of tile for several revolutions before rising to pack the sides. On its up stroke, the packer-head makes 40 revolutions, and 20 on its down stroke, so that each tile is of equal density from bottom to top.

Every stage of the operation is under direct lever control, and the machine is equipped with back gearing, permitted it to be operated at half-speed without changing the speed of the pulley; this is sometimes necessary in making a big tile. The Dunn "Automatic" makes six tile per minute. It saves the labor of at least one man, which means it will pay for itself in a year from this one feature alone. It is solidly constructed, with heavy base and large bearings, and all working parts are enclosed away from dust. It is claimed by the manufacturers to be the only tile machine that can be operated by one man. Makes all sizes, from 3 to 16 inches in diameter, and has a capacity of six tile per minute, or from 3,000 to 3,600 perfect tile per day.

Investigate this great time and labor saver. Write today for large descriptive folder and prices, addressing W. E. Dunn Manufacturing Company, 4139 Fillmore street, Chicago, Ill.

GENERAL OFFICE OF SANDUSKY PORTLAND CEMENT COMPANY MOVES TO CLEVELAND

The general office of the Sandusky Portland Cement Company, which has been located in Sandusky, O., since the organization of this company, will be moved to Cleveland, O., on August 1, 1915. The Cleveland office is already the headquarters of the treasurer, secretary, assistant manager and directors, and will now be combined with the offices of the president and general superintendent, and the sales publicity and accounting departments. All will be located in the Engineers building.

The business of this company has increased greatly in the past few years, and the change becomes necessary to handle all matters with promptness and dispatch.

THE LATEST STYLE IN MORTAR

One of the interesting changes that has been going on the past few years in brick construction work is the change in mortar from the old lime mortar to one made of cement. Perhaps there was a day in the dim past where sun-baked brick practically made its own mortar. Then came a period of using some resinous binder, and finally that period in the life of the brick and the brick industry in which lime and sand constituted the mortar generally used the world around in laying up brick work. The lime mortar is still used, but it seems to be steadily giving way to cement mortar. Some use a mixed mortar made of half lime mortar and half cement, but the strong tendency of the day is toward the use of a purely cement mortar. In fact, the tendency is so strong that some architects specify it and will not have any other kind, and here and there are city ordinances which show favor toward the cement mortar. The common specifications for cement mortar is one part of Portland cement to three parts of clean sand. Seemingly the ingredients may cost a little more, but it is made up just as it is used and is ready to use instantly, whereas lime mortar properly should be made up a week or two in advance. So the cement mortar is meeting with pretty general favor and it is claimed by some that it really does not add materially to the cost of construction as compared to lime.

NORTHERN GRAVEL COMPANY

One of the most important additions to commercial Muscatine (Iowa) during the past year was the Northern Gravel Company.

It is composed largely of Muscatine capitalists, was organized in the spring of 1914, for the purpose of producing washed and screened gravel and sand in large quantities and of uniform grades, for use in building, concrete, road and railroad construction of all kinds.

The plant consists of a sand pump, which excavates and delivers the material through a line of steel pipe into a dewatering pit; whence by means of a continuous bucket elevator it is lifted to the top of suitable storage bins, where it is met by a stream of clear water flowing at the rate of 600,000 gallons per day of ten hours, which not only thoroughly washes it, but also, through flumes and other appliances, conveys it to and through two lines of revolving and perforated screens, which separate it automatically and mechanically into five commercial sizes which drop from the screens into bins below. These bins have a storage capacity equivalent to twenty of the largest coal cars now used in railroad service, and by means of gravity loading devices, such cars are readily and quickly loaded, on a track served by chutes on one side of the bins; while wagons are just as easily filled in the same manner on a highway at the other side of the bins.

This plant has a daily capacity of forty cars.

JEFFREY CONVEYING EQUIPMENT

The cost of conveying equipment is often run up unnecessarily high by disregard of the best standard practice. It is logical to assume that the concern that designs and manufactures such conveying systems as are described in the new General Catalog No. 83-14, just issued by the Jeffrey Mfg. Co., 914 No. Fourth street, Columbus, Ohio, can well advise on the proper equipment to use, or the necessary methods to follow. Conformation to their standards will result in greater economy in the manufacture and to greater success in the operation as these standards will be the ones that have been found best fitted to the conditions of the conveyor operation.

SASGEN PORTABLE BUILDERS' DERRICK

Of the many products of the Sasgen Derrick Company, 2052 North Racine avenue, Chicago, their new steel Champion Portable Swing Builders' Derrick is among those that are attracting special attention. It seems to fill a long felt want. It can be operated by hand, horse or power. It weighs only 200 pounds and has a capacity of 1,000 pounds. It is 7½ feet in height and the boom extends 5 feet. The boom can be removed in a few seconds by loosening one nut and raising boom two inches. The bottom sills and must be bolted together, making the derrick in two parts, compact enough for the contractor to take the derrick from one job to another in an automobile.



For loads up to 1,000 pounds this steel Champion is credited with unexcelled performances. So well satisfied are the manufacturers with it that they say they will ship the machine to reliable contractors on trial.

This, however, is but one of many derricks and similar goods manufactured by this company. Their line of derricks include the Sasgen Setter derricks, Sasgen Pole derricks, Sasgen "A" Frame derrick, Sasgen Peerless Circle swing steel derrick, Sasgen Standard Circle swing builders derrick, Sasgen Circle Double boom wheelbarrow derrick, Sasgen Stiff Legged derricks, Sasgen Circle Swing counterweight derrick, Sasgen Tripod and Twin Setter derrick, etc. In addition they manufacture material elevators and an extended line of winches, grabs and similar appliances.

In their new Catalog No. 15 just issued by the Sasgen Derrick Company these various products are illustrated and described. A copy of Catalog No. 15 will be mailed you by mentioning Cement & Engineering News.

LINK-BELT LOCOMOTIVE CRANES

Book No. 158 of the Link-Belt Company of Chicago describes and profusely illustrates the Link-Belt locomotive crane, which combines, in one machine, a portable hoisting engine, swinging derrick, grab bucket loader and switch engine. Forty pages of illustrations show the ever-increasing application of the locomotive crane and its adaptability to a wide range of service and conditions.

The Link-Belt standard crane is a machine of all-round utility; it is driven by steam or electricity, and is equipped to operate grab bucket, hook block, electric lifting magnet, drag scraper bucket, steam shovel dipper and pile driver.

Various styles of grab buckets and different storage systems are illustrated in detail.

*Goodrich
promised to
cut my tonnage costs
and made good!
That's why Goodrich
gets my business and
holds it!
Supt. Wise*

Every Goodrich Conveyor Belt is flexible, troughs easily and hugs the pulleys. Users are writing us that they can remove edge-wearing guide idlers from their installations—our Belts are so true-running.

Goodrich LONGLIFE MAXECON CONVEYOR BELTS

Years of engineering study and rubber experience enable us to give you belts that won't shrink or stretch—eliminate spillage—that have the strength, the rubber cover and the edge construction that mean greatest economy and efficiency for *you* in the conveying department of your business.

We will gladly refer you to customers who are finding our belts best. You owe it to yourself and your cost sheet to get *the facts* on what our belts are doing in great plants all over the earth. Advise us regarding your installations.

Goodrich Products:

Conveyor Belts	Hose—all kinds
Elevator Belts	Packing
Transmission Belts	Valves, etc.

The B. F. Goodrich Company
Factories: Akron, Ohio

"Get in touch with Goodrich"

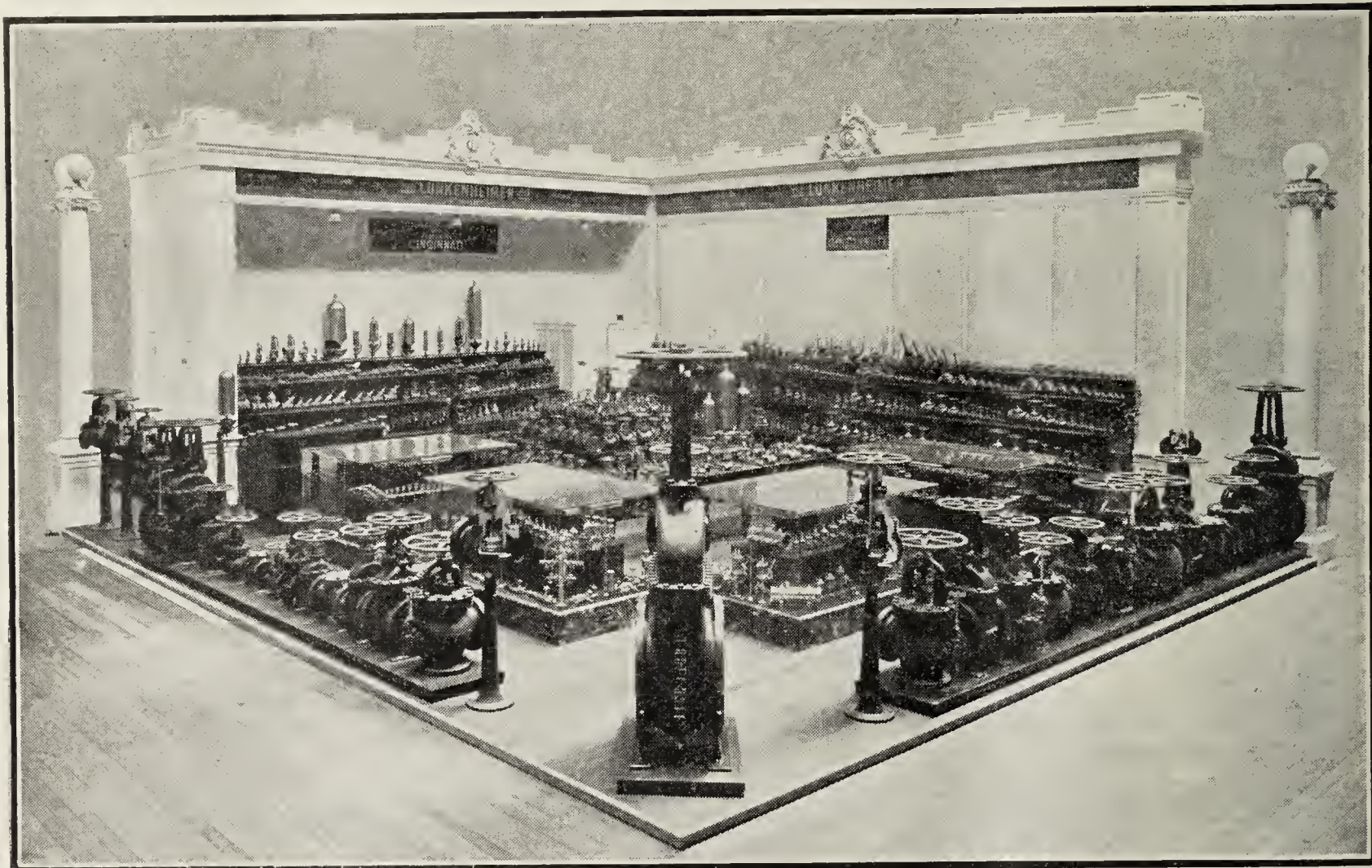
LUNKENHEIMER EXHIBIT AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION, SAN FRANCISCO, CALIFORNIA

A glance at the Lunkenheimer exhibit in Machinery Palace, immediately impresses the visitor with the exceptionally large and complete variety of engineering appliances which the Lunkenheimer Company manufacture. It is very evident that no expense was spared in the preparation of this exhibit. Although an exceptionally large number of articles are displayed, their arrangement is such as to lend an artistic, though neat appearance to the exhibit as a whole.

In great variety are displayed bronze, iron, "puddled," semi-steel and cast steel globe, angle, cross, check, gate, balanced throttle and non-return safety boiler stop valves; also bronze and iron pop safety, relief and blow-off valves; water columns and gauges;

cessive cost of monolithic concrete structures. The elimination of waste in materials, labor and hauling expenses, as well as establishment of permanent culverts are the prominent features of the Hall Interlocking Concrete Culvert, which is just making its debut in the East.

This idea originated with O. S. Hall, while contracting in the mountain region of Montana, where alkali, rushing mountain streams, extremely low temperatures and excessively expensive labor and materials brought forth all disadvantages a contractor can encounter. Cheap, temporary culverts were found too expensive in the long run and monolithic concrete had high first cost as objection, hence, development of a unit system, whereby five interlocking reinforced concrete sections can be molded at one time, which can be placed by unskilled labor under all conditions and



Lunkenheimer Exhibit at San Francisco Exposition.

whistles, ground key work, injectors and ejectors; bronze fittings and unions; cylinder lubricators, oiling devices, oil and grease cups; automobile and motor boat specialties, etc.

An examination of any of the articles displayed, at once reveals "Quality"—it being very evident that strength, durability and expert workmanship are prime factors in their construction.

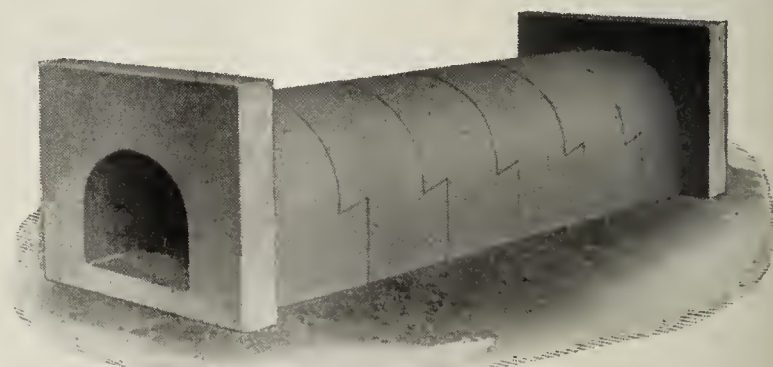
The Lunkenheimer Company have their executive offices and factories in Cincinnati, Ohio, although they maintain branch offices and selling agencies everywhere. Their claim of being the largest manufacturers of high grade engineering specialties in the world is fully substantiated by their large and elegant display.

Whether interested in engineering appliances or not, this exhibit is well worth seeing. Information pertaining to the line is cheerfully given by the attendants.

INTERLOCKING SECTIONAL CULVERT OPENS NEW FIELD TO CONCRETE CONTRACTORS

The use of breakable or corroding materials in road construction has always been a matter of displeasure with engineers, but has been enforced because of ex-

cessive cost of monolithic concrete structures. The elimination of waste in materials, labor and hauling expenses, as well as establishment of permanent culverts are the prominent features of the Hall Interlocking Concrete Culvert, which is just making its debut in the East.



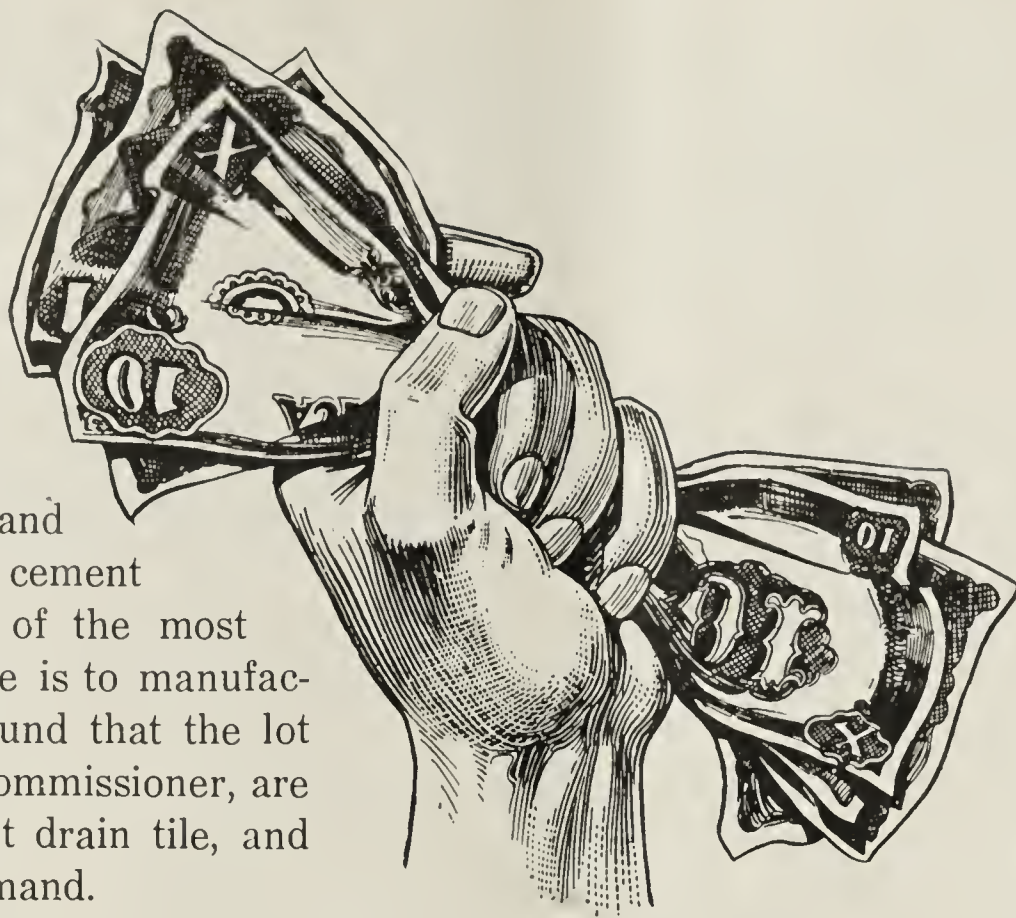
The Hall Interlocking Concrete Culvert.

These features are greatly appreciated by engineers and contractors who have seen money leak away on construction work due to delays in getting materials or in hauling. For this reason concrete contractors have practically resigned this field to the sheet-iron men in times past, and will be interested in this step toward permanent improvements in road building, especially in view of the rapidly growing good roads propaganda.

An Opportunity

for Concrete Workers, Dealers and Sand and Gravel Producers:

MANY building material dealers, sand and gravel producers and other cement workers have discovered that one of the most profitable investments they could make is to manufacture concrete drain tile. They have found that the lot owner and the farmer, and the county commissioner, are all live prospects for the use of cement drain tile, and that there is a constant and steady demand.



Why Don't You Manufacture Drain Tile?

The result will be increased profits and repeat orders. The local man who is manufacturing concrete drain tile for consumption in his territory is sure to reap a rich harvest.

The Richmond Power Drain Tile Machine

is the machine that will meet your every requirement. It is the result of ten years of study and experiment to produce the highest possible capacity at a small amount of maintenance and labor cost. And the price is within the reach of all.

SENT ON 15 DAYS FREE TRIAL

If you desire to increase your business and your profit you should write today and obtain complete information on this wonderful opportunity. Learn more about our guarantee and free trial offer, and how we stand always behind you with co-operative plans to boost your sales.



Our Co-Operation Plan That Starts The Dollars Rolling Into Your Pocket

We start your business off with a rush by a direct advertising campaign at our own expense. We get your customers for you, and once a farmer has used Richmond made tile, he is always a customer and a booster for you. The information about the wonderful possibilities of cement tile business, complete description of the Richmond machine and its wonderful capacity, the process of making the highest grade of drain tile at the lowest manufacturing cost on the smallest investment and all about our co-operative sales plan is found in our catalog.

WRITE FOR ONE TODAY

FARMERS CEMENT TILE MACHINE CO.

Box 330

ST. JOHNS, MICHIGAN

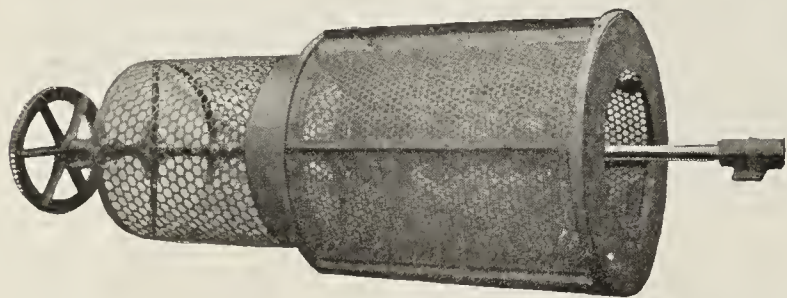
The outstanding feature of the building policy of Schulz & Hodgson, 948 Association building, Chicago, eastern distributors for this device, is the elimination of the cut-throat competition, which has done so much in late years to cheapen construction by use of inferior materials, the "Jack-leg," or amateur concreter being the contractor's evil shadow. The Hall Interlocking Culvert is being demonstrated and is meeting with generous commendation among highway engineers.

SLAG AND TRAP-ROCK CONCRETE

Slag and trap-rock concrete were recently compared by a 28-day test at Columbia University. Palisade trap-rock was used, separated into $\frac{3}{4}$, $\frac{1}{2}$ and $\frac{1}{4}$ -in. sizes, and dust, and combined so that the grading was identical to that of the slab, which was used as received from the National Slab Company. The sand was "Cow Bay," a typical Long Island sand, and the cement was a mixture of three approved brands, Atlas, Dragon and Kane. A mixture of 1:2:4 was used. In making up the complement of stone for each batch, proportional amounts of each aggregate were carefully measured by weight. It was thought that this procedure would insure greater uniformity in results. Four batches of each aggregate were made for this test. The resulting average compressive strength per square inch of slab concrete was 2465.5 lb. and of trap-rock concrete, 1975.5 lb. The slab concrete weighed 140.6 lb. and the trap-rock concrete 154.5 lb. per cubic foot.

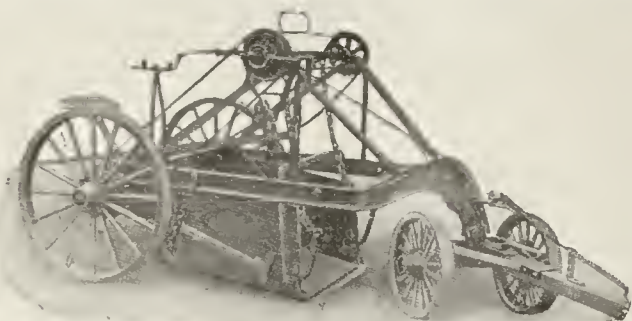
HIGH SCREEN EFFICIENCY AND LONG SCREEN LIFE

High screening efficiency and long screen life can only be obtained by the use of a screen properly designed and built of the best materials, with the best workmanship. Jeffrey screens successfully meet the service for which they are built. The Jeffrey bal-



anced shaking screen for the fine screening necessary in crushing plants are being successfully used throughout the country. This screen is perfectly counter-balanced and operates with no vibration or shocks on the supporting frame and with an even pull on the belt.

Cheap Subgrade Excavation! THE MANEY FOUR WHEEL CUBIC YARD SCRAPER



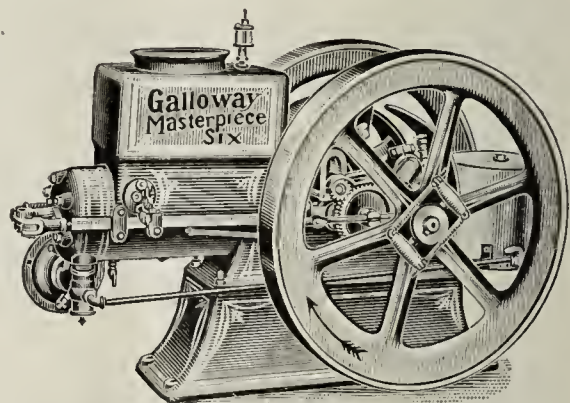
"The Self-Loading Dump Wagon"

Gets Double the Output of Old Style Wheelers at little more expense. An outfit can move from 400 to 500 cubic yards in ten hours. Hundreds of paving contractors use Maney's. Write at once for catalog and prices. The Baker Mfg. Co., 552 Stanford Ave., Springfield, Ill., U. S. A.

The Jeffrey revolving screen has proven most serviceable for crushing plants. They have heavy bearings, with tool steel wearing plate for end thrust, and detachable forged steel wearing ring. Diameters, 42, 48 and 60 inches, of any length. The Jeffrey Mfg. Co., 914 North Fourth street, Columbus, Ohio, declare they can solve your screening problem. Write for their new catalog, No. 83-14.

ENGINES FOR THE CONTRACTOR

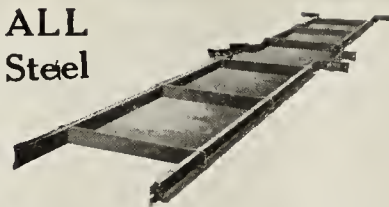
The catalog of the William Galloway Co., 1935 Galloway Sta., Waterloo, Iowa, contains descriptions of a number of engines of interest to the contractor. The manner in which the various styles are shown enables the contractor to inspect each one separately and to select the one which will do his work to the best advantage.



The catalog also describes and prices a great variety of other machinery and apparatus for the contractor including wagons, harness, auto trucks, pumps, cement mixers, etc. The catalog will be sent to our readers on request and will prove to be of value and interest.

ZEISER FORMS

ALL Steel



Sidewalk Curb, Curb and Gutter

Sold Direct to Users All Over the World

No commission for agents—hence Zeiser Forms can be sold for a low price.

Over a thousand satisfied users will tell you what they are worth.

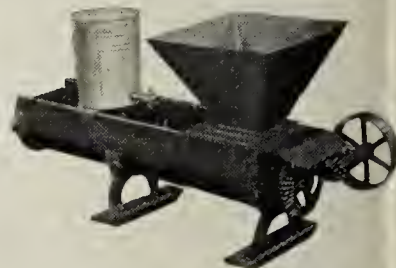
Write for the Contractors' Book

ZEISER BROS.

5318 E. 8th St., BERWICK, PA.



ONLY \$26.00 FOR X-L All Continuous BATCH MIXER



We make the largest line of small Batch and Continuous Mixers on the market. Whether you are a Cement Block, Brick, Tile Manufacturer or a Contractor, or whether you have a mixer, you should send for our literature as we make a specialty of manufacturing concrete mixers for different lines of work.

The chances are that it might pay you to discard your old mixer after you see the X-L All Special and we know it will pay you to investigate if you have use for a concrete mixer.

Burrell Manufacturing & Supply House
KANKAKEE, ILL.

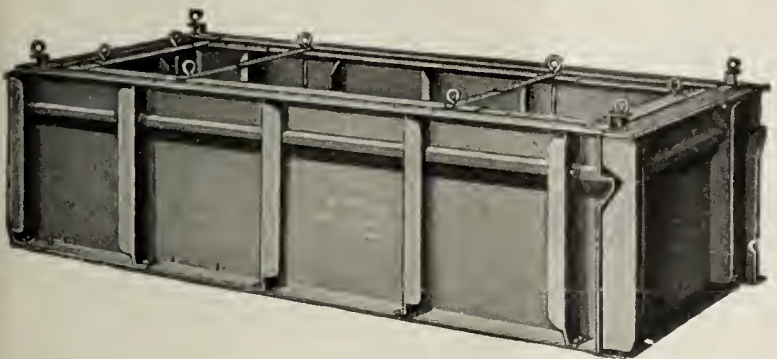


The Vault that SELLS

We show above an illustration of our vault. Note the smooth finish which is given to it by the machine—**no troweling necessary**. This vault sells easily on its fine appearance and its very evident strength and prominence. The lid seals onto the body automatically and positively.

The Machine that Makes It

This machine is adjustable so you can make any required size of vault with it. There isn't a seam or a rivet or a nut on the inside to mar the finished product. You can see that the side molds are heavily reinforced—that means strength and durability.



Honest, now, why not look into this big business opportunity right now—learn all about its possibilities?

If you have never looked into the burial vault business, you haven't any idea of its possibilities. If you have simply investigated one system of vault manufacture you may have drawn wrong conclusions.

Hundreds of plants in this country are turning out our type of burial vaults and making a nice annual profit. It's a manufacturing proposition, pure and simple, requiring a limited amount of capital, small factory space and practically no sales organization. Your regular force of men can manufacture the product at odd times. This work can be done in any corner of your plant.

The demand for your product keeps up the year round, and is unaffected by general business conditions. You sell your vaults in large lots and not to individual purchasers. Aren't those features descriptive of a first class business opportunity?

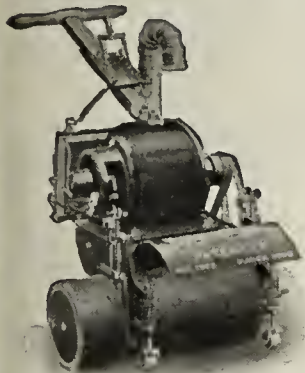
This big book tells HOW

We manufacture machines for making vaults. Our book on the burial vault business is not large, but it contains a mass of information on the very points you are most interested in. It tells just exactly how the vaults are made, what the manufacturing cost is, how they are sold and for how much. It describes a number of successful plants now in operation and our present customers tell their own stories. Write for a copy of this book today.

AUTOMATIC SEALING VAULT CO.
208 East River St. - - - Peru, Ind.

TEST AND TRY BEFORE YOU BUY

The Schluter Rapid Floor Surfacer



The Schluter BALL BEARING electric floor surfacing machines for mosaic, marble, composition and wood floors are the most simple constructed machines on the market. Direct chain drive AUTOMATIC DUST COLLECTORS. No gears or clutches to wear. Made in various styles.

OVER 5,000 IN USE ALL OVER THE WORLD

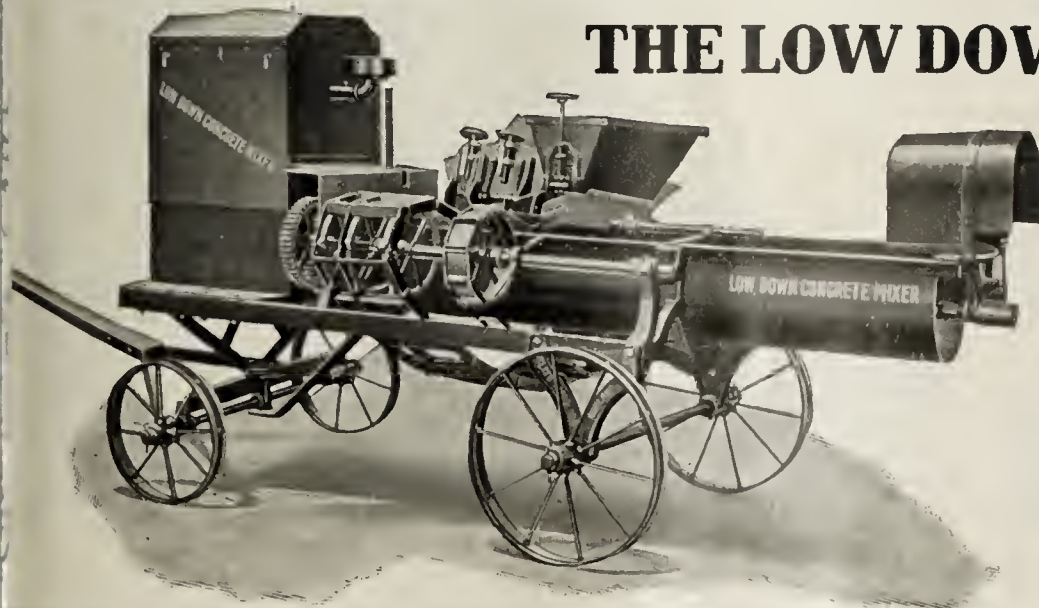
Send for prices and free trial proposition



THE M. L. SCHLUETER CO.

225 W. Illinois Street, CHICAGO

THE LOW DOWN FORCE FEED MIXER



has a capacity of from 4 to 12 cu. yards an hour with a forced feed and stroke off measurement different from all others. It gives absolutely perfect proportions whether the materials are wet or dry. Cannot clog. You can set and lock the feed gates so there will be no variation.

Few parts, open-to-view mechanism and low down hoppers make this mixer economical in operation and upkeep. Feed can be changed without stopping the machine. Safety friction clutch enables you to stop or start the machine without stopping the engine. Construction perfect. Price remarkably low.

Find out more of the Low Down's good features. Send for Catalog "B," which gives detailed information. Mention Cement & Engineering News when writing.

ELITE MFG. CO., Ashland, Ohio

There's a Lansing Mixer for Every Job

For the painstaking contractor who takes pride in building first-class sidewalks, curbing and foundations, as well as the highly capitalized construction companies building speedways, skyscrapers and subways, which must be first-class—there is a Lansing

and They're Always on the Job

One contractor is operating 5 number 15 Lansing Mixers on the New York Municipal Railway, Sea Beach Line in Brooklyn—open cut with concrete retaining walls and the intersecting streets carried on concrete arches.

Instead of concentrating a few big mixers down in the cut and hoisting his concrete up—he keeps his five Lansings up on the street level and pours the concrete down.

The whole job is humming all the time.

So, on a small scale, do the smaller contractors register a saving through the use of Lansing Mixers.

Write for our new Catalogue—just out—No. 354

LANSING COMPANY

LANSING

MICHIGAN

OR ADDRESS OUR NEAREST WAREHOUSE

NEW YORK, 288-289 West St.
MINNEAPOLIS, 330-4 No. First St.
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SAN FRANCISCO, 338-48 Brannan St.

BOSTON, 78 Cambridge St.,
Charlestown, Dist.
KANSAS CITY, 1413-15 W. 10th St.
CHICAGO, 169 W. Lake St.

No. 5
LANSING



No. 7
LANSING



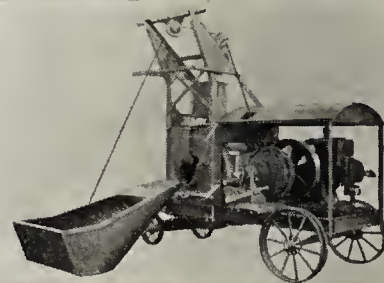
No. 10
LANSING



No. 12
LANSING



No. 15
LANSING



SAVE \$100—WHY NOT?

"The Quality Mixer at the Right Price"



The Bottom Knocked
Out of High Mixer Prices

Buy the
Republic "Six"
at
Your Own Price

When quality and price meet you get an investment worth while
See Catalog showing

**LOW CHARGING HOPPER
BATCH HOPPER
POWER LOADER
HOISTING ATTACHMENT
SPOUTING ATTACHMENT**

**\$100
TO
\$295**

The strongest and best built mixer of this class on the market. Put it in use anywhere. Haul it over the roughest roads. Put it up against any mixer regardless of price for quickness and thoroughness of mix and if you don't find it a bigger, better mixer in every sense of the word, send it back and we will refund your money.

Guaranteed REPUBLIC "SIX" Insured

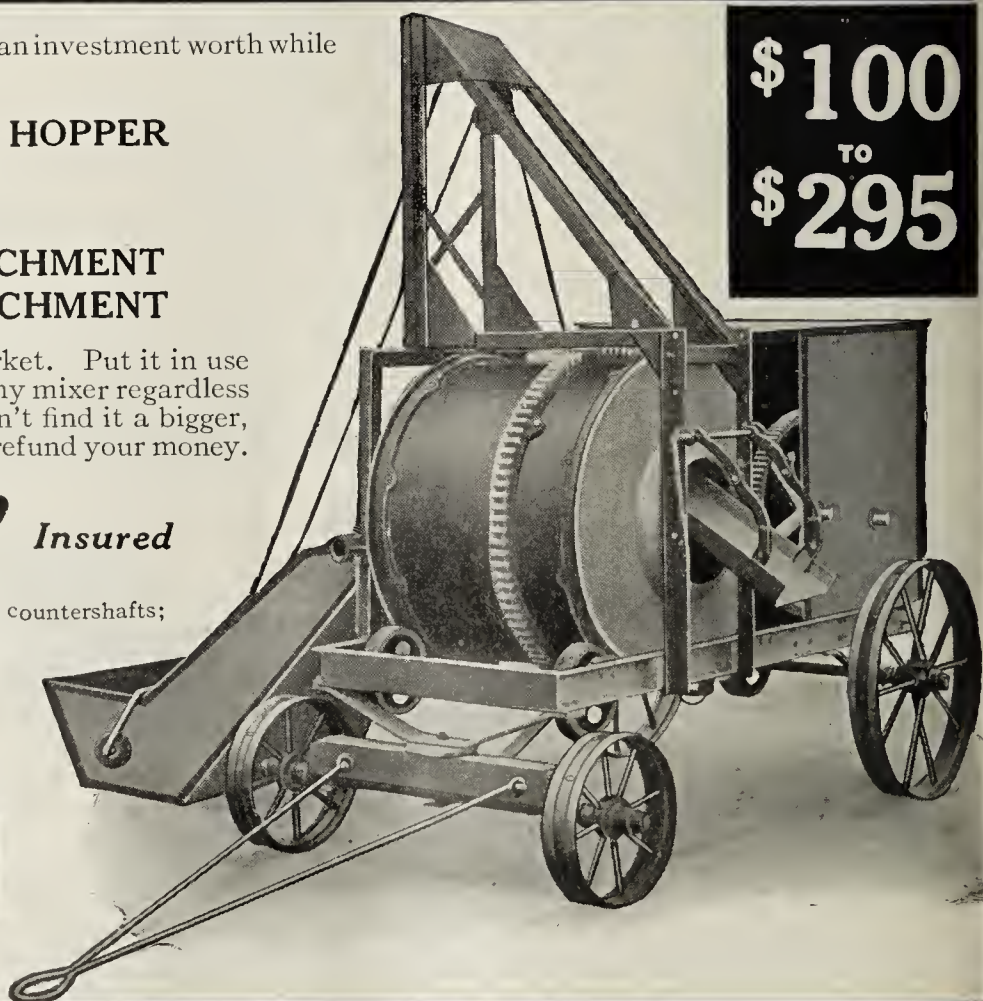
Notice this high grade construction—5-inch steel channel frame; steel countershafts; steel gears; frost and dust proof engine; 30-inch x 4-inch rear wheels; gearless power loader; light weight; low charging hopper; a 30-second mixing drum—everything like the \$2,000 pavers.

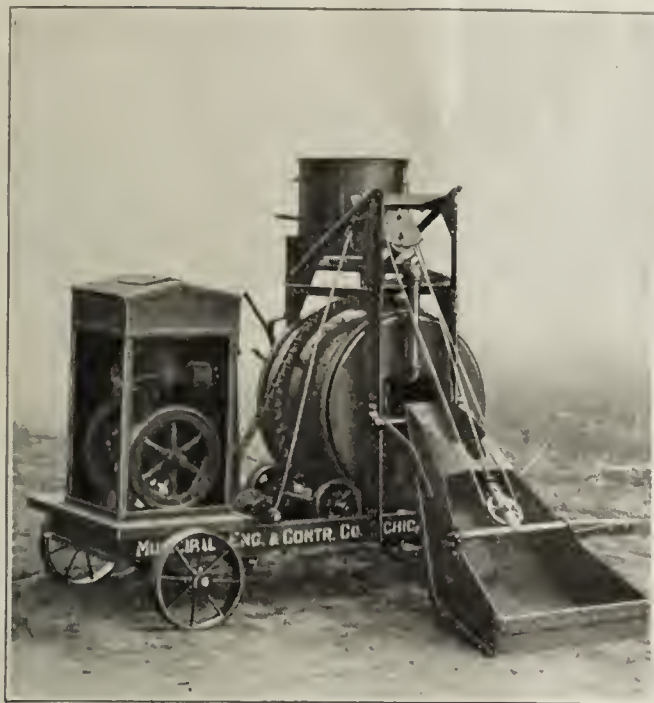
You can't go wrong on this mixer. Write today, before you forget and let us tell you in how many ways the REPUBLIC "SIX" will make and save money for you.

THE REPUBLIC IRON WORKS

TECUMSEH, MICH.

PITTSBURGH, PA.





Efficient Concrete Mixing at a Small Investment

That's what the New Austin Drum Mixer makes possible. Built to meet the requirements of contractors who demand an *efficient* but *inexpensive* mixer, it produces super-excellent concrete in *great volume* and insures long, continuous service at *low cost of production and maintenance*.

AUSTIN Drum Mixers

embody the same mechanical superiorities that have made Austin Cube Mixers famous around the world. The drum is built of riveted heavy blue enameled steel plates and is *extraordinarily strong* owing to the arched construction of the end discs. The circumferential rack and flanged roller tracks provide still further rigidity and insure practical indestructibility. Will mix a 1-2-4 mix and has a capacity of from 60 to 80 cubic yards a day. Operated by $3\frac{1}{2}$ horse power gasoline engine in steel house. Equipped with charging elevator and 20 gallon water tank. Charging hopper will hold a full batch. Mounted on portable truck unless otherwise ordered. Weight, 2,500 pounds. *And for a mixer like this we ask only \$325.* If you're in need of an intermediate sized mixer you *can't afford to pass this one up.*

Write for bulletin No. 21-D which gives full details.

Municipal Engineering & Contracting Company

New York Office: 30 Church St.

Main Office: Railway Exchange Bldg., Chicago

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Western N. Y., Henry W. Littlefield, Buffalo, N. Y.
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Maryland, Va., No. and So. Carolina, R. C. Hoffman & Co., Baltimore, Md.
Inter-Mountain District, H. N. Steinbarger, Denver, Colo.
Washington, F. S. Burbank Co., Seattle.
San Francisco Office, 473-485 Sixth street.

(AGENTS WANTED IN OPEN TERRITORY)

OWNERS AGREE ABOUT BOSS MIXERS

Low-Charging
Barrow Hopper
Hinged Loading Platform



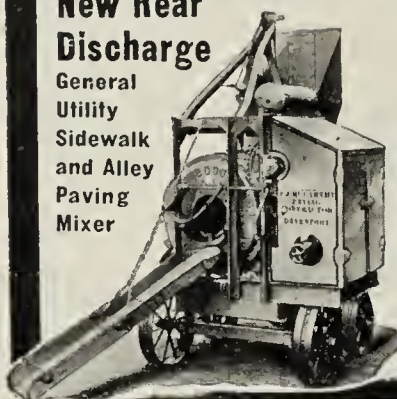
RE-ORDERS TELL THE STORY

U. S. Gov.	3
Elkhart Bridge Co.,	11
Madison, Wis,	
Keokuk Lumber Com-	5
pany	
Whitewater Bridge	4
Company	
W. C. Hight, Toledo,	2
Ohio	
100 OTHERS HAVE	
RE-ORDERED	

1400 IN USE
BAG
AND
HALF BAG
SIZES

"LIGHT WEIGHT"
BOSS
BUILT OF STEEL

New Rear
Discharge
General
Utility
Sidewalk
and Alley
Paving
Mixer



HYATT ROLLER BEARINGS
ONLY ONE OF NEW FEATURES

GET COMPLETE CATALOG

PRICES ASTONISHINGLY
LOW---CASH OR TERMS

PROMPT SHIPMENTS FROM
STOCKS IN ALL LARGE CITIES

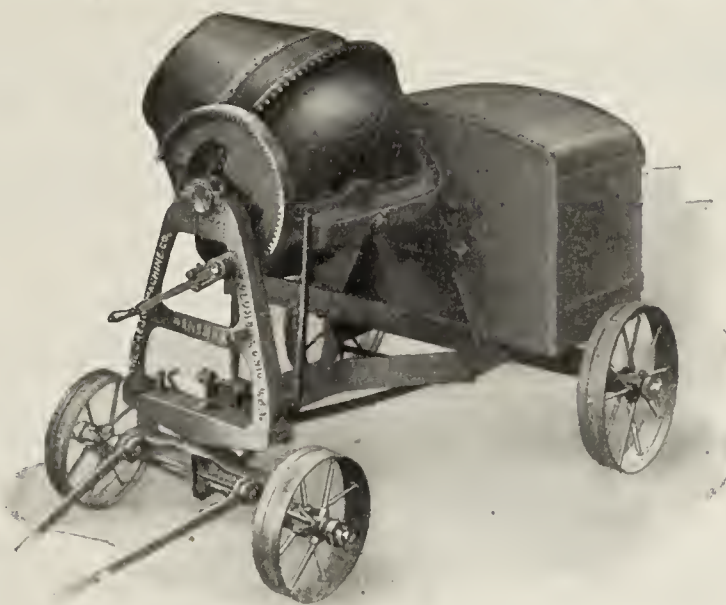
THE AMERICAN CEMENT
MACHINE CO., INC.

9635 JOHNSON ST. KEOKUK, IOWA

STOP! LOOK! LISTEN!

Just the Mixer You've Been Wishing for

THE BIG-AN-LITTLE



Just a little bit better than the one you thought was best

1915 Model NOW READY

The small mixer has proved its worth. Contractors see that it pays better to have one or more small portable mixers than to mix by hand or to have a great big clumsy mixer. The question has been to get a **DEPENDABLE** Small Mixer at a low price.

The **Big-an-Little** is the biggest and best small mixer on earth, and our low prices amaze the mixer world.

Your neighbor has one. They are used everywhere. Ask him.

Write us

The Jaeger Machine Co.

212 W. Rich Street

Columbus, Ohio



Why Unload Material by Hand

at a Cost of 15c to 20c a Yard?

When You Can Unload Material from Cars to Trucks with an Eclipse Unloader at a Cost of 2c a Yard

The Eclipse Portable Stone Unloader does this by unloading your Crushed Stone, Gravel, Sand, Slag, Coal, etc., from Hopper Bottom Cars to wagons at the rate of 10 Cars per 10 hour day.

Your wagons or trucks are loaded in $\frac{1}{2}$ minute instead of $\frac{1}{2}$ hour—by one man instead of 10 or more shovelers. No delays, no waiting for loads—your drivers and hauling equipment are kept busy all the time.

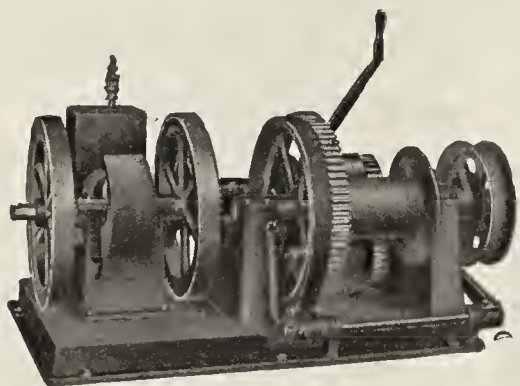
The Eclipse Portable Stone Unloader is saving contractors thousands of dollars annually. Go over your cost records and figure how much money an unloading cost of 2c a yard would save you—then write for all the facts.

THE GALION IRON WORKS & MFG. CO.

Home Office & Works, Galion, Ohio

BRANCH OFFICES: New York, Harrisburg, Enid, Okla., Richmond, Atlanta, Durham, N. C., Moberly, Mo., Philadelphia, Pittsburgh, Chicago, Baltimore, Milwaukee, Memphis, Des Moines.

BUILDERS' HOISTS and MATERIAL ELEVATORS



Hoist and Engine complete, direct connected, three sizes, 5, 6 and 8 H.P.

Every up-to-date builder and contractor should post himself on the most economical way to elevate building material. We have prepared an interesting booklet on

HOISTS and ELEVATORS

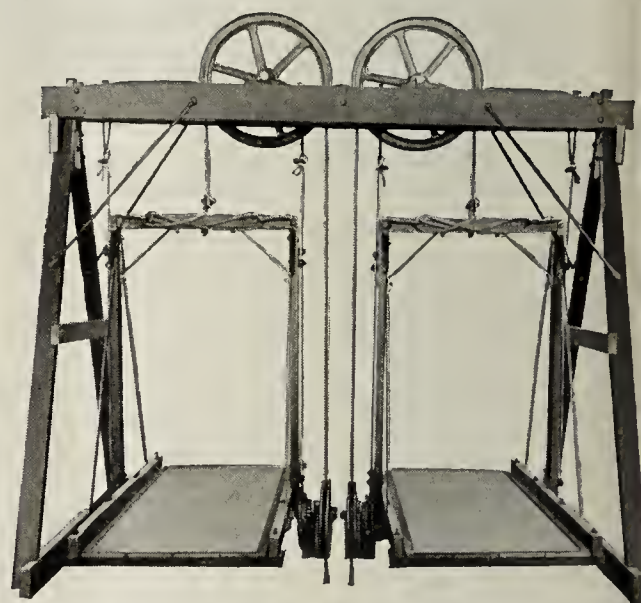
which we will send to anyone interested.

Write for it.

Bates & Edmonds Motor Co.

114 Hill Street

Lansing, Mich., U. S. A.



Double Platform Elevator for any Elevation



Silo Roof Facts

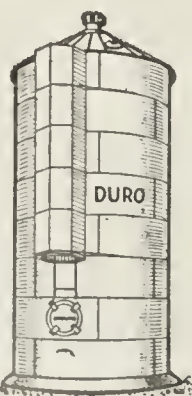
THAYER'S Self-Supporting Opening Silo Roof has solved the silo problem for silo owners. Adds 25 per cent capacity to a 24 foot silo. A 12 section metal Roof attached to 24 Rafters that OPEN OUT leaving Top of Silo open and FREE from cross-pieces, post or braces.

As all Our Roofs are Erected from the Inside of Silo, the Same Platform that is Used In Building Silo can be Used to place Roof on Silo. Our Patent Rafter-Irons are the HANDIEST, STRONGEST and Easiest way to FASTEN a Silo Roof to a Cement Silo known of. Fastened with set screw bolts. For Sale by Silo Contractors, Silo Mfg., Silo Agents, or direct to you where we have no agents.

Agents Wanted. Write for catalog and prices.

H. M. THAYER CO., Woodhull, Illinois

"DURO" METAL Tops—Doors—Frames and



Forms for Erecting
Concrete Silos and Tanks
PURE IRON GALVANIZED

will last as long as the silo.
Write for prices. Manufactured
only by

C. C. Fouts Co., 220 Canal St.
Middletown, Ohio

The Perfection Concrete Stave Silo

made by the "wet mix" system.

The staves are so formed that any diameter of silo can be built. The staves are made by the "wet mix" system by casting them in our steel moulds. The product is a strong, non-porous, water proof stave, made with common labor and right at the "silo job." No factory required; you save railroad freight, loading and breakage of staves.

Our "All-Steel Door-System"

is ideal and just what the silo feeder demands. Doors continuous from bottom to top of silo; size 24x25 inches in the clear.

Concrete Workers

get into the Concrete Stave Silo business. It is a growing and permanent business, and our system makes you big Profits.

Get the best form of construction—one that can not be out classed later.

Get the "Perfection."

Write us to-day for our liberal proposition to supply you with our steel moulds and exclusive territory. Let us give you facts and figures on ease of erection, permanency of construction and low cost and big

Profits

to you. You will be highly interested. Write to-day.

Perfection Concrete Stave Silo Co.

506 Clapp Building

DES MOINES, IOWA

CAREY

Elastite

NAME U.S. Patent Office.
REG. EXPANSION
JOINT

"The Sandwich Joint"

Used to take care of expansion and contraction in concrete roads and streets.

Thousands of feet installed during 1914. We will gladly tell you where.

Write for sample and literature.

"Remember We Are the Pioneers"

THE PHILIP CAREY COMPANY

23 Wayne Ave. Lockland, Cincinnati, O.

Everybody Is Buying Them

"PIONEER"

Expansion Joint Compounds

Because they are uniform throughout, economical to lay, unaffected by climatic conditions, and

Because they know that "Pioneer" quality means something.

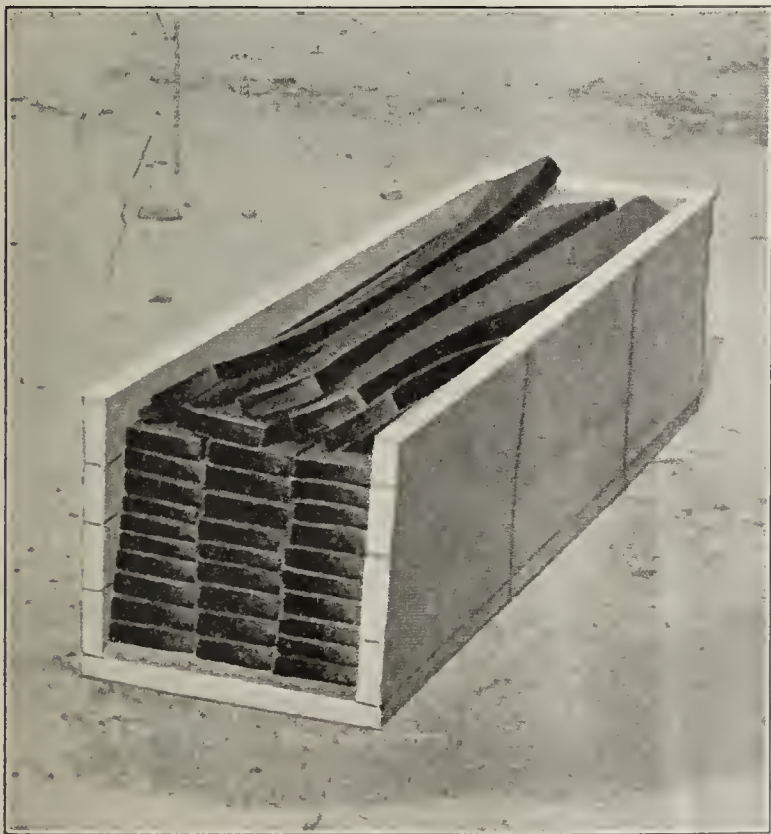
Get a sample and price
before buying elsewhere

THE PIONEER ASPHALT COMPANY

Producers of highest quality bituminous products

LAWRENCEVILLE, ILL.

Genasco Expansion Joints



have all the advantages of other prepared joints for concrete, wood-block, brick and granite-block pavements—economy, ease of installation, the avoiding of melting and pouring—and besides this

Are All Asphalt

The entire thickness of a Genasco joint serves the purposes of expansion and contraction. Ready-made joints that contain felt or some other form of re-enforcement cannot do the work of the Genasco all-asphalt joint. Any thickness or depth.

The best way to judge this joint is to see it. A life-sized sample will be sent to any one interested. Write for it today.

THE BARBER ASPHALT PAVING COMPANY
Philadelphia, Penna.

SLAG from blast furnaces for Concrete

Blast-furnace slag used as an aggregate in concrete represents economy, safety and strength

For many reasons, blast-furnace slag is an ideal concrete material—its alkaline nature, tending to prevent rust in reinforced concrete—its light weight, enabling it, in floor slabs for instance, to support a given live load with smaller dead load on supporting frame—its contents of silica, alumina and iron, which increases the permanency of any concrete of which it is a part—its fire-resisting qualities—these are some of the features which have impelled the most careful engineers and architects to specify slag in place of other concrete aggregates.

The high crushing strength of slag-concrete has been demonstrated in various tests made of unprejudiced parties in nearly every large city. Slag-concrete has always developed strength uniformly higher than gravel-concrete or limestone-concrete.

Engineers and Architects

Blast-furnace slag as a concrete material is better understood than it used to be. Before you write your concrete specifications, get in touch with any of the following competing producers of blast-furnace slag—let them submit the results of long-time tests of slag-concrete.

Birmingham Slag Co.

1001 Woodward Building
Birmingham, Ala.

The Sommerfield Co., Inc.

1863 61st Street
Brooklyn, N. Y.

The France Co.

Second National Bank Bldg.
Toledo, Ohio



The Commonwealth Power Co. tunnel under Grand Ave., Milwaukee, Wis., recently successfully waterproofed with

"Hydrite"

COLORLESS WATERPROOFING

Hourly Leakage 5200 Gallons STOPPED! 700 ft. Concrete Tunnel 55 feet below datum was made watertight.

The success of our method eliminated the necessity of pumps and SAVED \$80.00 to \$100.00 PER MONTH.

In addition to the possibility of damage to the cables, etc., from the seepage. This tunnel, 10 years old, has been free from leakage for nine months, or since work was completed. We guarantee it to stay so.

HAVE YOU A WATERPROOFING PROBLEM?

Difficult waterproofing problems in NEW or OLD work can be economically and successfully solved. The experience of a successful organization is at your service and satisfactory results are guaranteed.

Our method of applying grout, internally or externally, under heavy pressure through pipes, or upon the surface, as the conditions require, is applicable to tunnels, reservoirs, foundations, basements, etc., of masonry or concrete construction. Leaks are not only stopped but the structures are strengthened.

Let us help you with your waterproofing problem. Write us concerning our product and methods. Ask for descriptive booklet.

WATERPROOFING COMPANY OF AMERICA MILWAUKEE, WIS.

Branch Offices:

543 McCormick Building, Chicago. Callahan Bank Building, Dayton, Ohio.
1014 Transportation Building, Montreal, Canada.



MARION COUPLINGS

Splice Your Bars

Save Steel

GIVE continuous reinforcement with positive lock and additional bond.

FORM TIES made with short sections of bar may be removed after concrete has set, leaving no steel protruding.

*Stock Shipments—Low Prices
Send for Samples*

The Marion Malleable Iron Works
Marion - - - Indiana



The Reason Why You Are Not Making Cement Drain Tile Is Because You Have Not Yet Investigated Its Possibilities

The superiority of cement tile for drainage purposes is known; there is no competition in quality or price. For this reason its future use is assured, as well as its present use.

The cement drain tile business does not require a large investment—nor skilled labor—nor hard selling. A few hundred dollars will start you right; you can use unskilled labor; you can sell all the tile you manufacture without any difficulty.

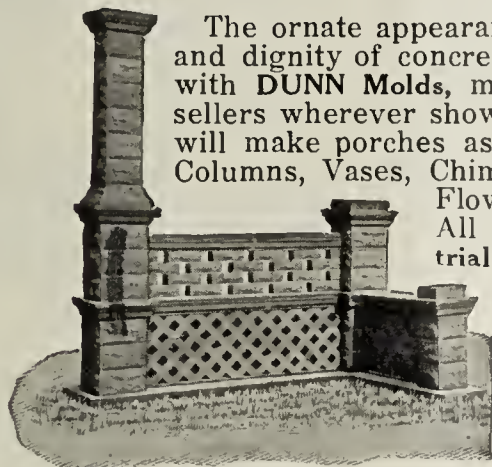
And we are prepared to guarantee profits ranging from \$230 to \$800 a month.

Ask us today for printed proof of comparative costs and profits in making tile; we send this information free upon request.

Dunn equipment is sold on 15 days' trial; write for the tile equipment catalog. Price of Dunn No. 1 Tile Machine.....

\$165

Concrete Porches Pay a Bigger Profit Than You Think.



The ornate appearance, permanence and dignity of concrete porches made with DUNN Molds, make them ready sellers wherever shown. Dunn Molds will make porches as illustrated, also Columns, Vases, Chimneys, Balusters; Flower Boxes, etc. All sold on 15 days' trial.

Write for Porch Mold catalog today. Price of outfit for making porch as shown,

\$39



Don't Tamp Sewer Pipe—POUR IT!

Tamping a semi-dry mixture, to make large drain tile and sewer pipe, is not only slow, troublesome and costly—but unnecessary. Pouring a wet mixture into DUNN Molds, besides being the most efficient method, assures the strongest product. Reduces manufacturing costs, too, and increases the profits.

Dunn Molds permit the manufacture of all size pipe, from 6 to 36 inches in diameter. All sold on 15 days' trial: Pipe Mold catalog gives full descriptions and prices, ask for a copy. Price of 12-inch mold.....

\$7.50



Pat's No. 842262 and 782700

Here's Mixer Value Out of the Ordinary

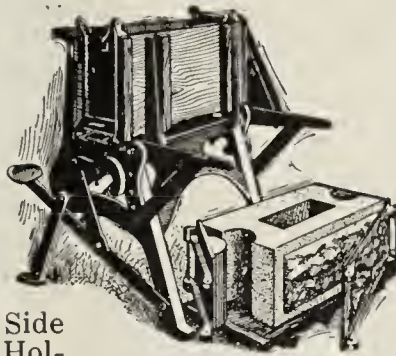
Let facts—not claims—influence your buying judgment. You buy concrete mixers because of what they are, not because of what they are claimed to be. To learn about the Dunn construction is to learn the reasons why a DUNN Mixer is the mixer you have waited for.

Dunn Mixers have four mixing blades and extra long drums, giving them the highest possible mixing efficiency. The convenient loading height and the power discharge feature, save labor. Their capacity—a batch a minute—is assurance of ample speed. The one-piece hollow yoke makes the operation almost noiseless. The all steel and iron construction is evidence of long life.

Write today for catalog describing all styles and sizes. We sell on 15 days' trial. Prices.....

\$67.50 to \$224

Use Three Block Machines—but Buy only ONE



To make Face Down, Side Face and Two-Piece Hollow Wall Cement Blocks usually requires three machines. But one DUNN Combination Cement Block Machine will make all three types. Saves two-thirds the usual investment.

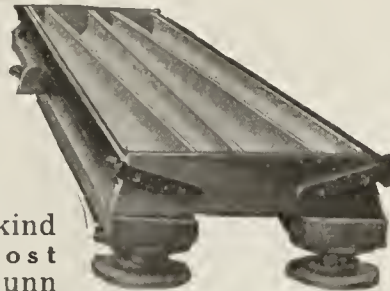
By using a wet mixture it saves considerable tamping, and makes a stronger block. And a special off-bearing system protects each block against breakage. Capacity, 150 blocks daily.

Sold on 15 days' trial. Write for Block Machine catalog. Price.....

\$40

The Concrete Fence Posts that Sell the Quickest

Are those of high quality and moderate price. These are the kind that DUNN Fence Post Molds made. The Dunn system enables quick and economical manufacturing. Tamping is eliminated by our special Vibratory Base which compacts each post to uniform density and firmness. Made in batteries of four and ten. Sold on 15 days' trial. Price of 4-mold battery.....

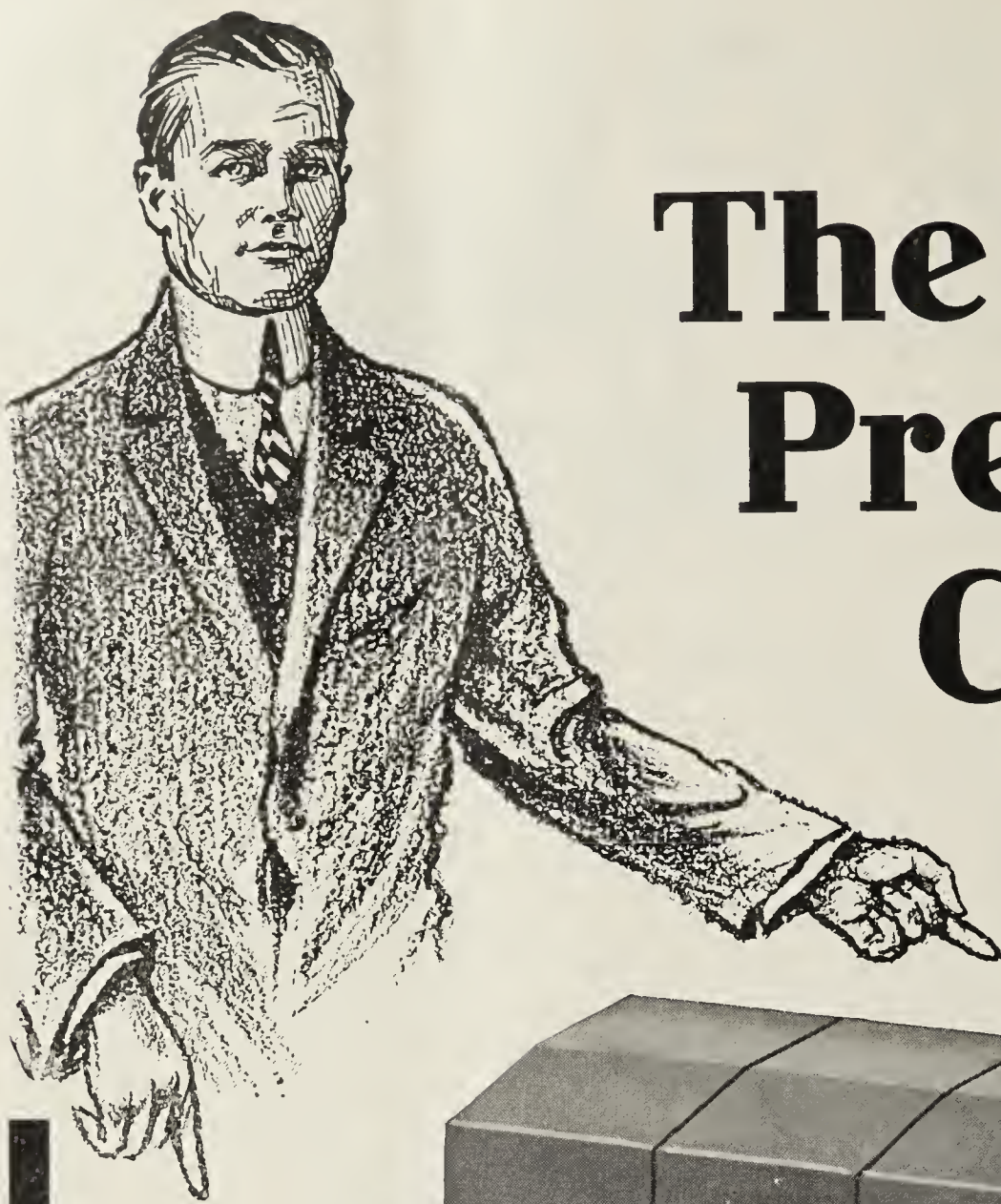


\$12.50



W. E. Dunn Mfg. Co.
4139 Fillmore St., Chicago

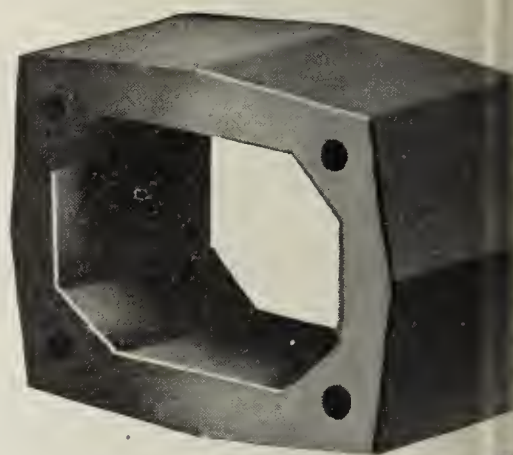
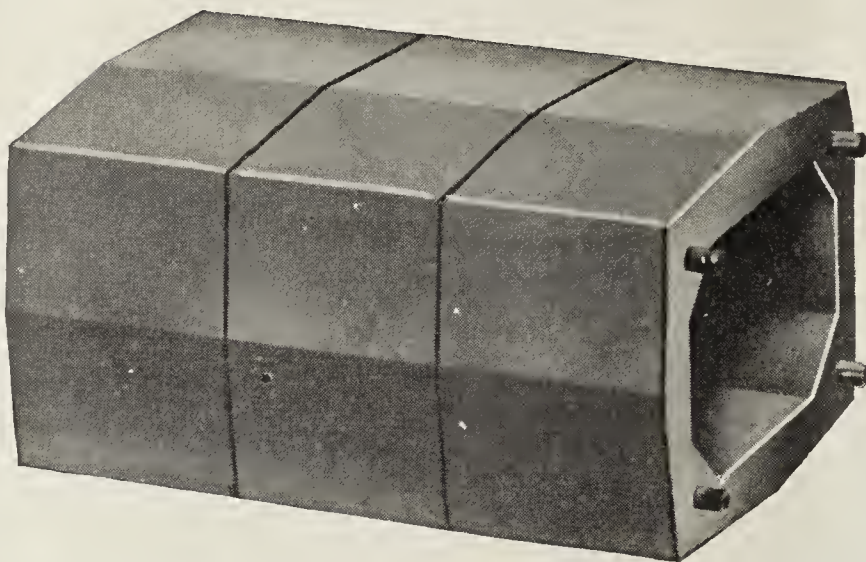




The Security Premolded Culvert

An Effective, Permanent and Economical Culvert

Where Concrete Material Is Available These SECURITY Culvert Units Can Be Made Under Our System for Less Cost Than Temporary Culverts.



THE use of premolded units of reinforced concrete for road, railroad and other culvert work is becoming more popular, due essentially to the economy and the exceedingly satisfactory results attained by their use.

The Security Premolded Culvert is the only sectional, premolded, reinforced concrete culvert now on the market that fills all the necessary requirements of a well designed type of culvert.

The units of the Security Culvert can be molded anywhere conditions permit, on the job, in your plant, or placed out on contract

with some concrete products manufacturer. These units can be shipped, like blocks, staves or tile, to the job and erected. The Security Culvert unit is properly designed to resist bending and securely fastened to prevent motion of any kind in any direction when assembled.

The forms in which the Security Culvert units are made are designed to prevent any mishap in the arrangement of reinforcing, and also to prevent any variation in the thickness of the unit.

These features insure full strength and make our system fool-proof.

We will furnish the entire outfits of forms and tools necessary for their manufacture, provided you want territorial rights. Here's your opportunity to secure a most modern and a most splendid system of culvert construction yet devised. It is up-to-the-minute. Once seen always in demand. The enterprising man of your vicinity will be sure to grasp this opportunity the minute he sees it. Are you the man of enterprise?

Inquiries will be given prompt attention and full information furnished. Don't put it off—it may be the very thing you have been waiting for.

THE SECURITY CULVERT CO., Minneapolis, Minn.

Here is what we mean when we say that The Polk System Renders the Service

The POLK SYSTEM builds circular monolithic concrete silos, water tanks, and grain storages at the LOWEST POSSIBLE COST OF CONSTRUCTION. The POLK SYSTEM gives the contractor a reputation for doing the best work in his line — builds for him a big, substantial business. The POLK SYSTEM brings prosperity to many a man who has spent years losing time and money at odd-job concrete work.

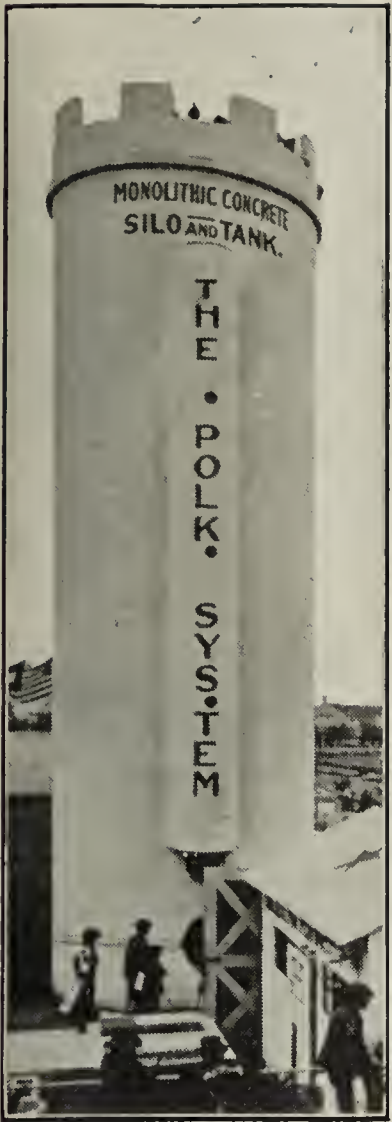
The best preparation you can make for a big business next year is to get some POLK SYSTEM work done this year. You can point to it with pride. It will talk for you all winter. It will be the best possible proof of what you can do. With it as an aid your time will all be contracted for before the "1916" building season opens.

Just Send a Postal Card

Polk-Genung-Polk Co.

Fort Branch, Indiana

"It Renders the Service"



A New Principle Invented in Cement Stave Silo Construction A Needed Improvement. Silos, Tanks, Etc., Built Any Size Desired

Mr. S. T. Playford, the originator of cement stave silos, has purchased an absolutely new type of silo. Those who have seen it—and who have made searching comparison with Mr. Playford's earlier efforts in cement stave silos, are united in saying that this invention creates a new standard by which silos must now be judged.

This new silo will be known as the S-T-P. The S-T-P Silo embodies the latest, up-to-date knowledge and experience in silo building. Being a new silo, we are not forced to cling to old ideas, patterns and machinery. We have in the most original manner produced a silo that is strikingly different—a silo of incomparable strength and matchless durability and efficiency. The S-T-P will enable you as a contractor to offer an A-No. 1 business proposition to the farmer. The

S-T-P Silo

"SILO THAT'S PERFECT"—Invented by W. A. Hillman

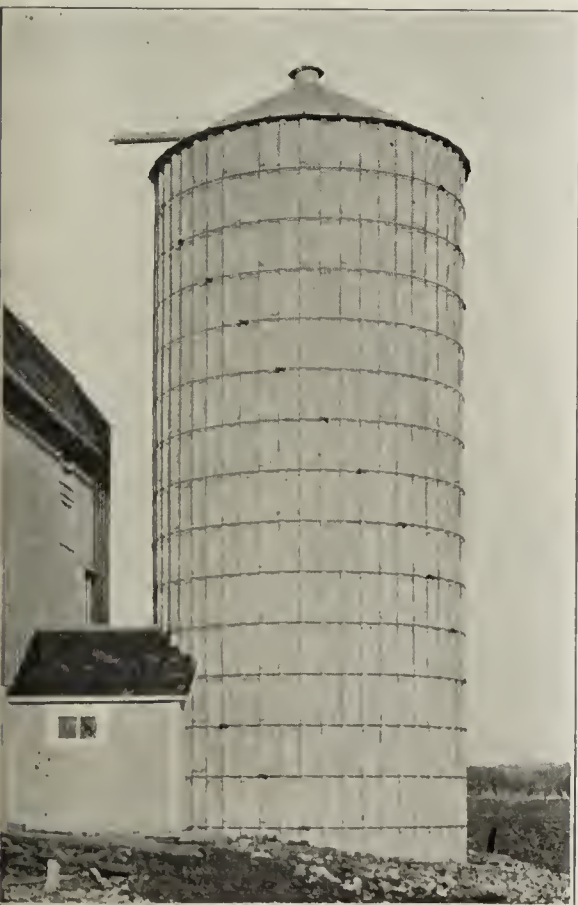
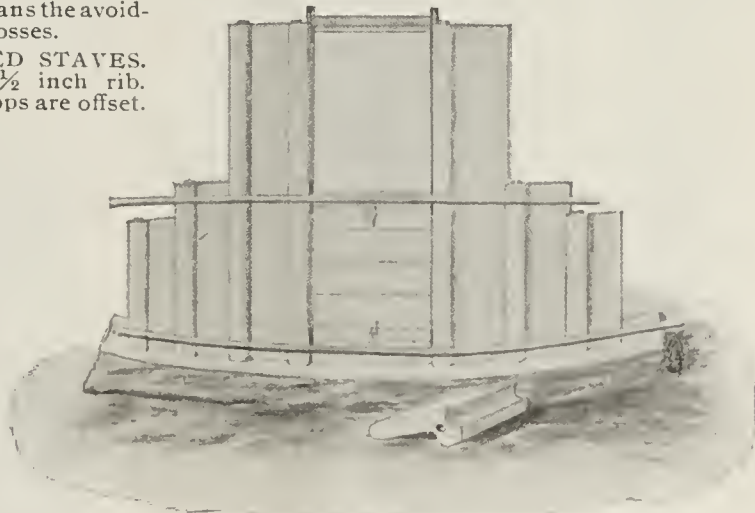
The more you know about silos, the more you will appreciate the S-T-P. The less you know about silos the more important it is that you learn about the "S-T-P." It means the avoidance of dissatisfaction and money losses.

The "S-T-P" is made of SLUSHED STAVES. Thoroughly reinforced. Has a 4½ inch rib. Pointed up on the outside. The hoops are offset. This to give a ladder to work upon.

*Write for circular,
prices and further
information*

**PLAYFORD
MFG. CO.**

**298 Douglas Avenue
ELGIN, ILLINOIS**



Minnesota Cement Construction Co., Long Prairie, Minn. Andrew Nordloef, Mgr. for Minnesota, No. and So. Dakota, Iowa Nebraska and Wisconsin

**Make Night Work Light Work
TURN NIGHT INTO DAY**

BY USING

BUCKEYE CARBIDE LIGHTS

From 500 to 10,000 Candle Power
at a cost of less than one cent
for each 1,000 c. p. per hour.

*Thousands in Daily Use
by the Largest Firms*

Write for Catalog No. C. E. 1 today to

THE MACLEOD CO.

215 East Pearl Street

CINCINNATI, OHIO



Staple Post Mold Co.
454 W. Home St., WESTERVILLE, OHIO

An Everlasting Cement Post INTO WHICH

Staples Are Driven

The same as into wood. In use since 1906 and absolutely practical

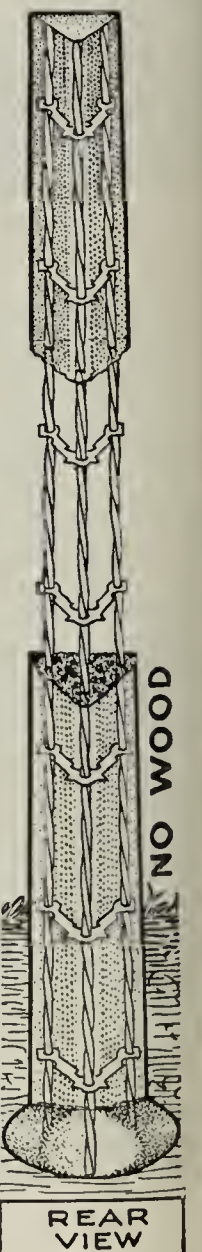
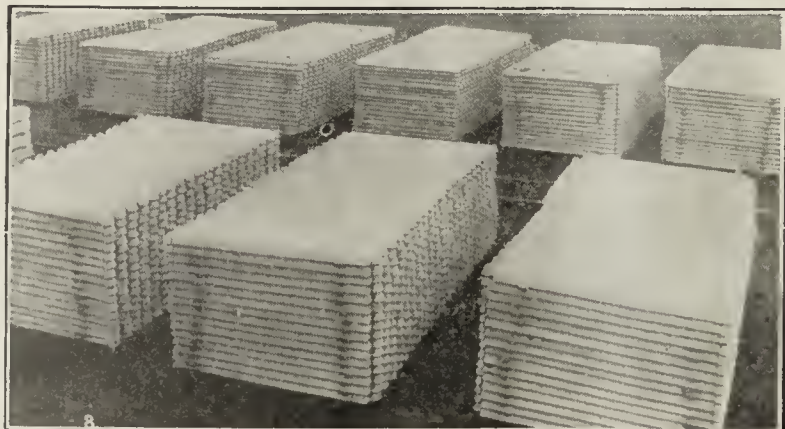
The Staples Hold

SEE THE REINFORCEMENTS

Strongest known to Engineers—Not a single complaint of posts breaking off at ground line—Lightest, strongest, easiest to make—compete with wood posts in many places.

MAKE STAPLE POSTS

A splendid opportunity for men of business and capital
Investigate and be convinced





MEDUSA WHITE PORTLAND CEMENT

USED FOR EXTERIOR FINISH OF
ST. FRANCIS WOOD GATEWAY, SAN FRANCISCO

MEDUSA White is an indispensable material for permanency, beauty and elegance in stucco, building ornamentation, concrete building blocks, interior decoration, statuary, cemetery work, setting marble, etc., and its artistic possibilities are unlimited. It is to be used in the same manner as ordinary Portland cement from which it differs in no respect except in its pure white color.

GIVE MEDUSA WHITE A TRIAL AND BE CONVINCED OF ITS SUPERIORITY

Don't fail to write for our new booklet
of illustrations and testimonials

SANDUSKY PORTLAND CEMENT CO.
CLEVELAND, OHIO



FRENCH'S PORTLAND CEMENT

Samuel H. French & Co.
PHILADELPHIA

HIGHEST STANDARD

Established 1844

RELIABLE POWER

FOR CONTRACTORS AND BUILDERS

To pump, saw, excavate, hoist, irrigate, run mixers, elevators and all heavy machinery. Can be had in Galloway engines from 1 1/2 to 16 h. p. All styles. 200,000 customers testify to quality. Prices 1/4 to 1/2 what's usually asked. Low freight.

17.95
H.P.

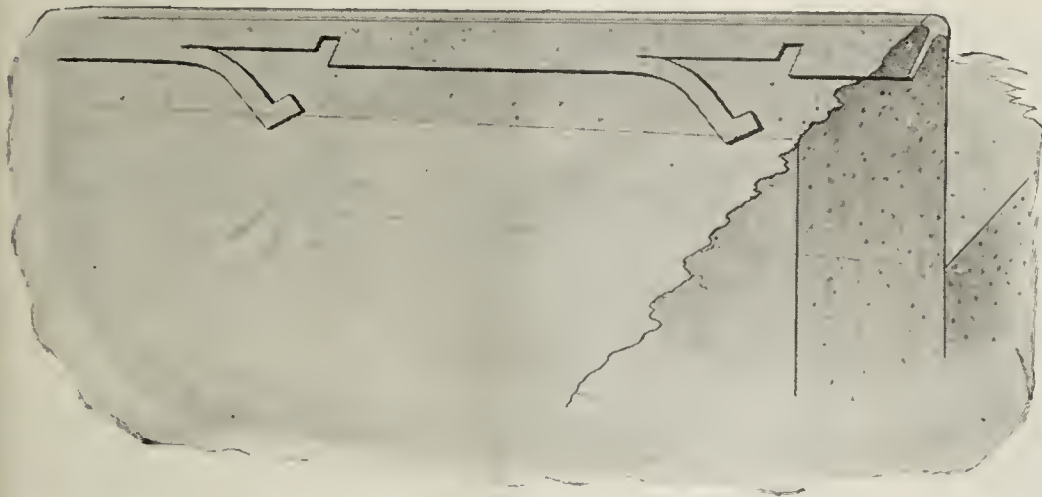
WM. GALLOWAY CO.,

Box E,

Waterloo, Iowa



ANY EDGE PROTECTOR



which anchors itself only to the very corner it protects, certainly defeats its own purpose.

The anchors of our hook bar are parts of the bar and extend deep into the body of the concrete, thereby fastening the curbing in a most positive and powerful manner.

AGENTS WANTED

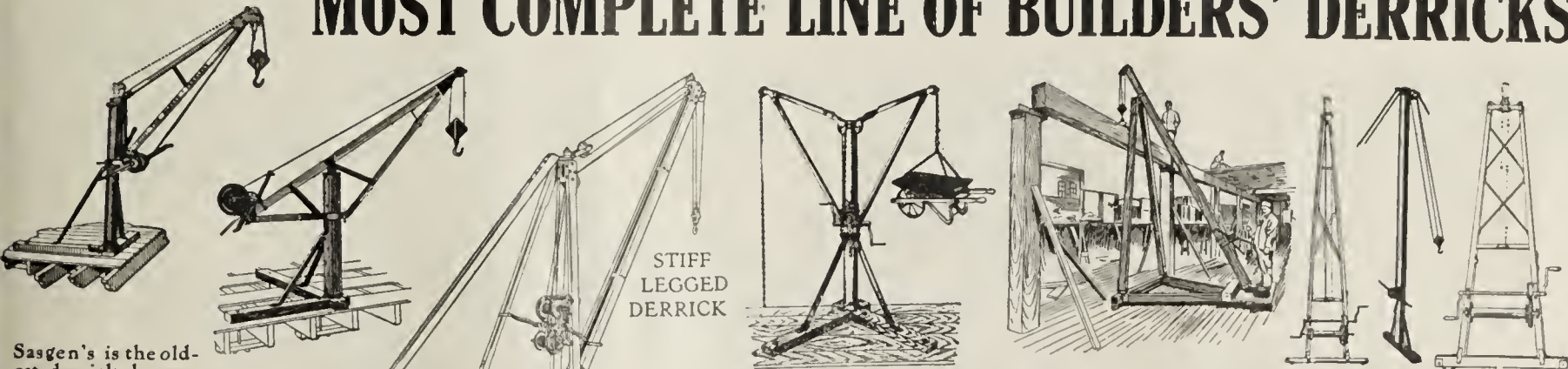
F. WILLIAM STOCKER, Inc.

Engineers

1031-1033 Clinton St.

HOBOKEN, N. J.

MOST COMPLETE LINE OF BUILDERS' DERRICKS



Sasgen's is the oldest derrick house in the country. We make the strongest, best and most reasonable price derricks.

SASGEN DERRICK COMPANY,

WRITE FOR CATALOG No. 15

We manufacture Steel and Wood Circle Swing Builders' Derricks, hand and power, Pole Setter, "A" Frame, Double Boom Wheelbarrows, Stiff Legged and Guy Line Derricks, Single and Double Drum Geared Winches, Blocks, etc.

2052 North Racine Avenue, CHICAGO

Compactness and Sturdiness Mean Greater Efficiency



The "Excelsior"

was designed and built to set a fast pace for the higher priced mixers and contractors say it does. Equipped with low hopper; friction clutch; dust proof bearings; 3 H. P. engine. Can be equipped with hoist at small additional cost. Capacity $4\frac{1}{2}$ feet mixed material per batch; easily 65 cu. yds. per day. Write for illustrated catalog and judge for yourself the extra value of the EXCELSIOR.

Good territory open for agents

Excelsior Mixer & Machinery Co.

606 Merrill Bldg.

Milwaukee, Wis.

AGENTS: Universal Steel Products Co., Chicago, Ill. L. & D. P. Smith, Valdosta, Ga. Loyal Power Co., Omaha, Neb. Manufacturers Supply Co., Minneapolis, Minn. Ward Equipment Co., Pittsburgh, Pa. E. W. Ripley, Farmington, Me.

Permanent Culvert at Minimum Cost



HALL INTERLOCKING CONCRETE CULVERTS

provide *permanent drainage* for roads and highways. Built in interlocking reinforced sections where *careful inspection* may be given the work. Can be installed quickly by *unskilled workmen*. Interlocking feature insures unity and prevents waste of material. No rust, corrosion or breakage.

Easy to manufacture, 5 sections cast at once. A profitable culvert from every standpoint. Collapsible forms for Hall Interlocking Culverts should be a part of every contractor's equipment. Low in price. Last forever. Write for full particulars.

SCHULZ & HODGSON

EASTERN DISTRIBUTORS

948 Association Bldg.

CHICAGO



No. 5 BLASTING MACHINE

FOR SAFETY'S SAKE
USE THIS NEW



BLASTING MACHINE

ELECTRICAL blasting is being adopted more extensively since the perfecting of apparatus and methods. The using of electrical current provides a more positive, stronger, efficient means of detonation than caps and fuse.

Electrical blasting enables the operator to determine the proper time for detonation to insure safety to all employees.

Electrical blasting eliminates hang fires, increases the efficiency of explosives and makes possible the firing of several shots at one operation.

For safety's sake, insist on your blasters using electrical blasting machines.

FOR SPECIAL INFORMATION ABOUT
ELECTRICAL BLASTING WRITE TO
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DU PONT POWDER CO.

Established 1802

**WILMINGTON
DELAWARE**

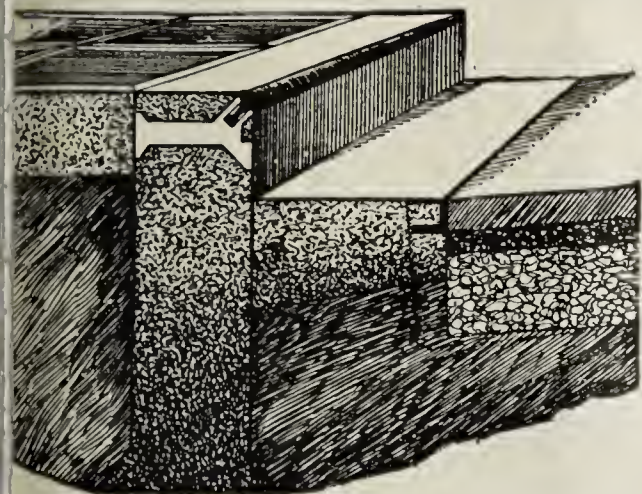
WAINWRIGHT STEEL-BOUND CONCRETE CURB

HAS A RECORD OF
SIXTEEN YEARS' USE WITHOUT A FAILURE
ABSOLUTELY NON-BREAKABLE. CHEAPER THAN GRANITE

THIS CURB WILL STAND HARDER
USE AND LAST TEN TIMES AS LONG
AS PLAIN CONCRETE CURBING

"WAINWRIGHT
PATENTS"

March 9, 1897
November 22, 1898
May 5, 1903
March 26, 1907
August 29, 1907
August 2, 1910



GALVANIZED STEEL CORNER BAR PREVENTS
CHIPPING OR BREAKING ON
EDGES

OVER
EIGHT MILLION
FEET

IN USE IN MORE THAN
FIVE HUNDRED CITIES
IN THE UNITED STATES



MECHANICALLY PERFECT AND
UNEQUALLED FOR CURVED
CORNERS

THE WAINWRIGHT GALVANIZED STEEL CORNER BAR

IS THE ONLY BAR THAT CAN BE DEPENDED ON TO PERMANENTLY RETAIN ITS PLACE IN CONCRETE. THE RECOGNIZED MERITS OF THE WAINWRIGHT BAR HAVE MADE IT THE STANDARD CORNER BAR FOR CONCRETE PROTECTION, AND IT HAS BEEN SPECIFIED FOR YEARS BY THE UNITED STATES GOVERNMENT, LEADING CITY ENGINEERS, RAILROAD OFFICIALS AND RESPONSIBLE CONTRACTORS.

THIS BAR IS SELF-ANCHORING, THE DOVETAILED WEB HOLDING IT FIRMLY IN PLACE EVERY INCH OF ITS LENGTH, PRESENTING A RESISTING DEPTH OF TWO INCHES OF SOLID STEEL, AT EVERY POSSIBLE POINT OF IMPACT.

THE SUPERIORITY OF THE WAINWRIGHT GALVANIZED STEEL CORNER BAR OVER COMPETING DEVICES IS DUE TO THE SOLID ROUNDED HEAD AND CONTINUOUS INTEGRAL ANCHORAGE, ALSO GREATER WEIGHT OF RESISTING MATERIAL.

FROST WILL NOT DISPLACE THE WAINWRIGHT BAR AS IT
WILL ANY BAR ANCHORED AT INTERVALS

SEND FOR BOOKLET NO. 4

STEEL PROTECTED CONCRETE CO.

Real Estate Trust Bldg., PHILADELPHIA, PA.



SIDEWALK FORMS CURB AND GUTTER FORMS

The contractor who bids on sidewalks, curbs, curb and gutters with the idea of using wooden forms is generally bidding under a definite handicap and will always do the work with less profit than he could with steel forms.

HELTZEL steel forms represent the very latest designs and their use means better work and better profits. Spread over the work of a season or two they mean a lower form cost per running foot of sidewalk than the use of wood forms. They are easily assembled. Work is fine, accurate and even. Write today for Free Catalog.

Heltzel Steel Form & Iron Works
Niles Road, Warren, Ohio



Long Handled
Cement Finishing
Tools
Operated
Automatically

One Man With The Double Action Cement Tools Can Do the Work of Five

in a given time with old style finishing tools—
which means a SAVING of EIGHTY PER CENT
OF THE FINISHING COST OF YOUR WORK.

All Our Finishing Tools Work Automatically

Finishing Trowel has 24-inch blade; 16-inch
trowel with jointer attachment, edger and float.

BETTER WORK AT LESS COST

Send For Catalog and Prices

ABRAM CEMENT TOOL MFG. CO.
DUGGER, IND.

There's Sense in Steel

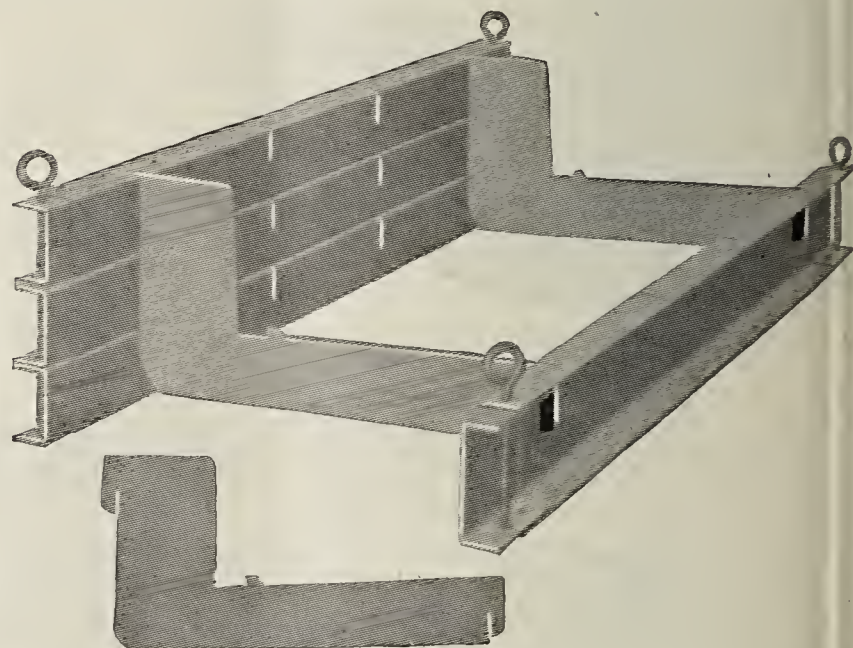
just as well as there are cents in the use of
Indiana Steel Forms.

For **\$13.⁷⁵**



you can buy enough Indiana Steel Side-
walk Forms to lay 78 running feet of
walk 4' or 5' wide per day.

The sense of buying these particular **steel** forms for
your work lies in the fact that the same forms can
also be used for curb and gutter construction by simply
adding the curb and gutter steel dividing plate.



Steel Forms mean permanent equipment.
That's why many of the largest and smallest con-
tractors are using **steel** forms in place of wood.

Steel means smooth, clean work. Indiana Steel
Forms are simple in construction. No wedges, pins,
ratchets, bolts or nuts to bother with. You will see the
advantage of them after a try out.



You Can't Overlook the Above Offer

It is limited, so better write for more particulars right
now. Surely you cannot afford to putter along with
wood forms when you can buy **steel** forms at this price.

Write for Our Literature

Indiana Concrete Mold Co.
216 East River St., Peru, Indiana

Investigation and Experience Are Proving the Reliability of Hydrated Lime for Waterproofing

Concrete Work. Architects, Engineers and Contractors everywhere are being interested in and are investigating the worth of Hydrated Lime as a waterproofing. Experience and actual application are proving to them beyond shadow of doubt that **HYDRATED LIME** is reliable, permanent and harmless.

It is usually employed in proportions of about 10 parts of lime to 90 parts of cement, or 10% of the cement is replaced with the lime.

Hydrated Lime is an extremely fine material, being much finer than the finest Portland cement; hence the material fills the voids in the concrete mass, making a denser and therefore more nearly waterproof substance.

THE reinforced concrete standpipe at Westerly, R. I., and illustrated herewith, was waterproofed with Hydrated Lime. The contractor says, "As the tower is to be made watertight simply by the density of the concrete, great care is being exercised in the choice of aggregate and cement and in the methods of mixing and placing. Frequent and accurate analyses are made to determine the voids in the sand and stone, so that the proper proportions of aggregate and cement to secure the maximum density of concrete may be used. About the average mixture by volume is one yard of stone to one yard of sand; 2-5-11 barrels of cement to one yard of concrete and about 5 per cent of hydrated lime.

Another large concrete tank has been successfully waterproofed with Hydrated Lime. The new 250,000 gal. reinforced concrete tank, 50 ft. in diameter, 16 ft. deep and with 8-in. thick walls, built by the R. L. Whipple Company, Worcester, Mass., for the artillery post at Ft. Strong, Boston Harbor, has been found to be absolutely water tight. Great care was exercised in proportioning and mixing the concrete. The mix was 1 cement to 4½ gravel, to which 5 per cent hydrated lime was added.

Hydrated Lime is shipped in 40 or 50 lb. paper bags, or 100 lb. burlap bags. It is a dry, unpalpable powder, which can be easily and safely stored.



Concrete Standpipe Waterproofed with Hydrated Lime

Full detailed information of the methods and cost of using this material may be secured from any of the following competing manufacturers of Hydrated Lime:

Saginaw Lime & Lumber Co., Saginaw, Alabama.

Ohio & Western Lime Co., Huntington, Ind.

Security Cement & Lime Co., Hagerstown, Md.

Lee Lime Co., Lee, Mass.

Charlevoix Rock Product Co., Charlevoix, Mich.

White Marble Lime Co., Manistique, Mich.

Dutchess County Lime Co., Dover Plains, N. Y.

Rockland & Rockport

Lime Co., 101 Park Ave., New York, N. Y.

The A. & C. Lime Co., Canton, Ohio.

Kelley Island Lime & Transport Co., Cleveland, Ohio.

National Lime & Stone Co., Carey, Ohio.

John D. Owens & Son Co., Owens, Ohio.

Woodville Lime & Cement Co., Toledo, Ohio.

Gager Lime & Mfg. Co., Chattanooga, Tenn.

Dittlinger Lime Co., New Braunfels, Tex.

Round Rock White Lime Co., Round Rock, Tex.

Riverton Lime Co., Riverton, Va.

International Lime Co., Sumas, Wash.

Standard Lime & Stone Co., Fond du Lac, Wis.

WANTED & FOR SALE DEPARTMENT

FOR SALE.

\$650.00 Zagelmeyer Car System outfit for making slush blocks. First man with \$350.00 gets them. Address Humboldt Cement Products Mfg. Co., Humboldt, Iowa.

Chief chemist, at present employed, desires change of location. Can furnish best references from past and present employers. College graduate. 12 years' successful experience. Address W., care Cement & Eng. News, Transportation Bldg., Chicago.

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We can save you 25 to 50 dollars on a concrete mixer. High grade machines, fully guaranteed. Get our price before you buy. Superior Mfg. Co., 1405 Concrete Ave., Waterloo, Iowa.

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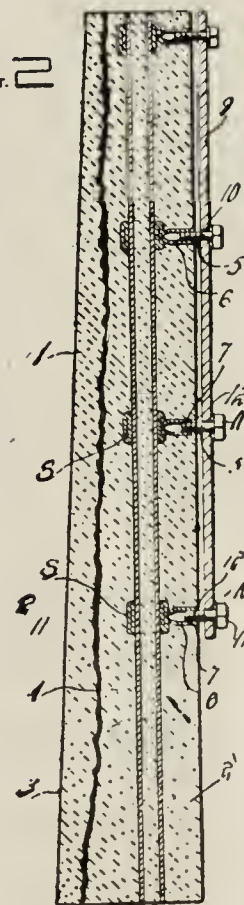
Have a real vacation on the Great Lakes, the most enjoyable and economical outing in America. The cool lake breezes, the ever-changing scenes along the shore, and the luxurious steamers of the D. & C. Line are positive guarantees that you will enjoy every minute of your trip, and return home refreshed and glad you went. Daily service between Detroit and Cleveland and Detroit and Buffalo. Four trips weekly from Toledo and Detroit to Mackinac Island and way ports. Two trips weekly, special steamer, Cleveland to Mackinac Island, no stops enroute except Detroit and Alpena. Special day trips between Detroit and Cleveland during July and August. Daily service between Toledo and Put-in-Bay. RAILROAD TICKETS AVAILABLE FOR TRANSPORTATION on D. & C. Steamers between Detroit and Buffalo or Detroit and Cleveland either direction. Send two-cent stamp for illustrated pamphlet and Great Lakes map. Address L. G. Lewis, G.P.A., Detroit, Mich. Detroit & Cleveland Navigation Company Philip H. McMillan, Pres., A. A. Schantz, V.P. & G.M. All Steamers arrive and depart, Third Ave. wharf, Det.



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PATENT NO. 1,107,406

FIG. 2



THE UNIVERSAL CEMENT POST

is the only cement post to which a plank fence may be attached without the use of a single nail. It is the only cement post which holds the fence in such a manner that it is impossible for cattle to ride it down, or hogs to go under it.

Further, it is the only cement post for building speedway and ball park enclosures; fastening of boards is an easy matter.

This post will not break at the ground. Our special process of reinforcing takes good care of that part. Can be made in any shape, design or length to match any design one may want to carry out.

The Universal Cement Post is the only all-feature post on the market. Large corporations want this post. A live state agent is wanted to take care of the demands for this post in each state and Canada.

My mutual plans will be profitable to all concerned. Write at once. Address all correspondence to

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General Agent

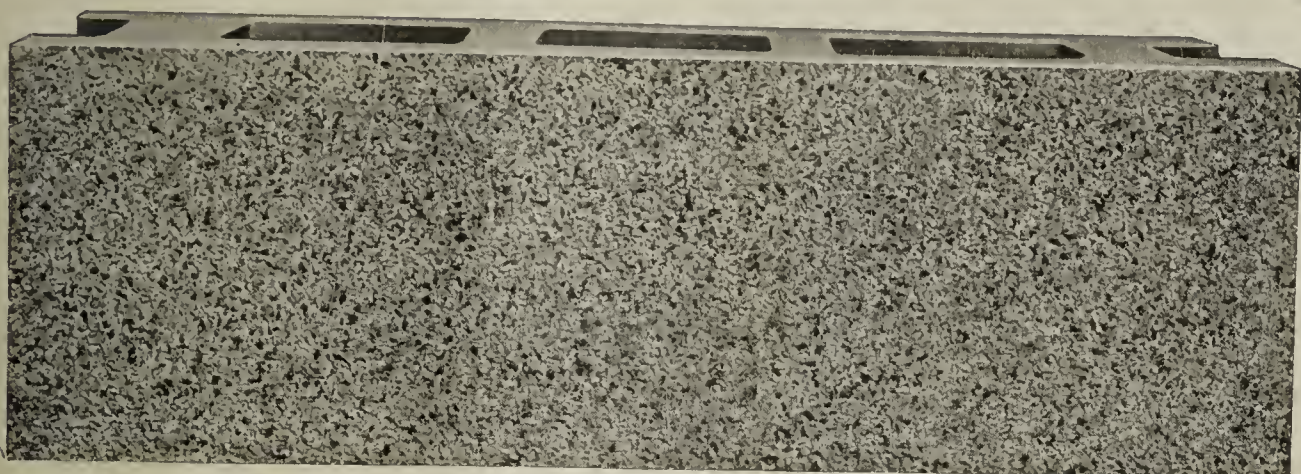
MORRISTOWN, INDIANA

SERIAL NO. 929,291

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OF CASTING

Hollow Cement Building Blocks WITH GRANITE FACES



8x8x24 inch Granite Smooth Face Block

*They Cost Less
They Sell for More
You Sell More of Them*



Enlarged View of Granite Smooth Facing

BY A NEW process, which protects the facing, while the block is being cast, we eliminate all traces of cement from the face of block and nothing but the GENUINE GRANITE SHOWS IN ALL ITS SPARKLING BEAUTY.

These cuts show blocks just as they came from the molds, they are not treated with acid or scrubbed with brush, or sprayed.

We challenge the whole world to show us a cement block, made by any other system, at any cost, that equals these blocks for beauty, strength, quality or imperviousness to heat, cold or moisture.



8x8x24 inch Granite Rock Face Block

Send us fifty cents and we will send, freight prepaid, to any point in the United States, east of the Mississippi and north of the Ohio Rivers, a granite-faced block, one-half rock-faced and one-half plain-faced. YOU WILL SAY WHEN YOU GET IT THAT YOU NEVER SAW A CEMENT BLOCK BEFORE.

They are positively cheaper to make than the ordinary dry-tamp, sand faced block.

MR. BLOCK MAKER: What show will you have if your competitor secures the exclusive right for this system in your city?

ASK US ABOUT OUR MOLDS FOR MAKING SILO BLOCKS.

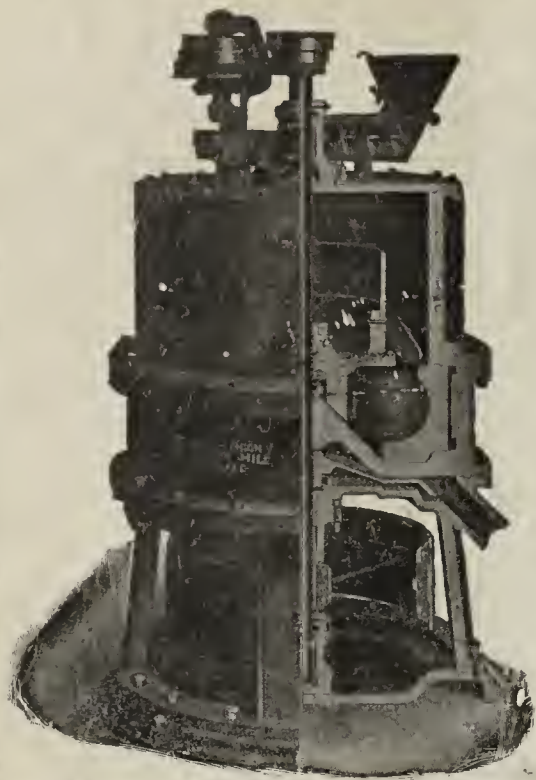
Send for a Catalog fully describing our system and showing our multiple molds mounted on trucks, for casting hollow cement building blocks.

Zagelmeyer Cast Stone Block Machinery Company

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The Fuller-Lehigh Pulverizer Mill.



Produces Commercially

Cement having a higher percentage of Impalpable Powder than can be obtained by any other mill. Tests show that the tensile strength of a 1-5 mortar made with cement pulverized by the Fuller Mill is higher than the tensile strength of a 1-3 mortar made with cement pulverized to the fineness required by the Standard Specifications.

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Cement Companies equipped with Fuller Mills advertise the fact that The consumer gets 38 pounds more of the Impalpable Powder or Real Cement in every barrel of cement produced by The Fuller Mill than by any other.



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"OLD RELIABLE"
"XX" SHOVEL CHAIN

Some manufacturers make several grades of so-called Shovel Chain. We make one grade.

Made only by THE HAYDEN CORBETT CHAIN CO.,

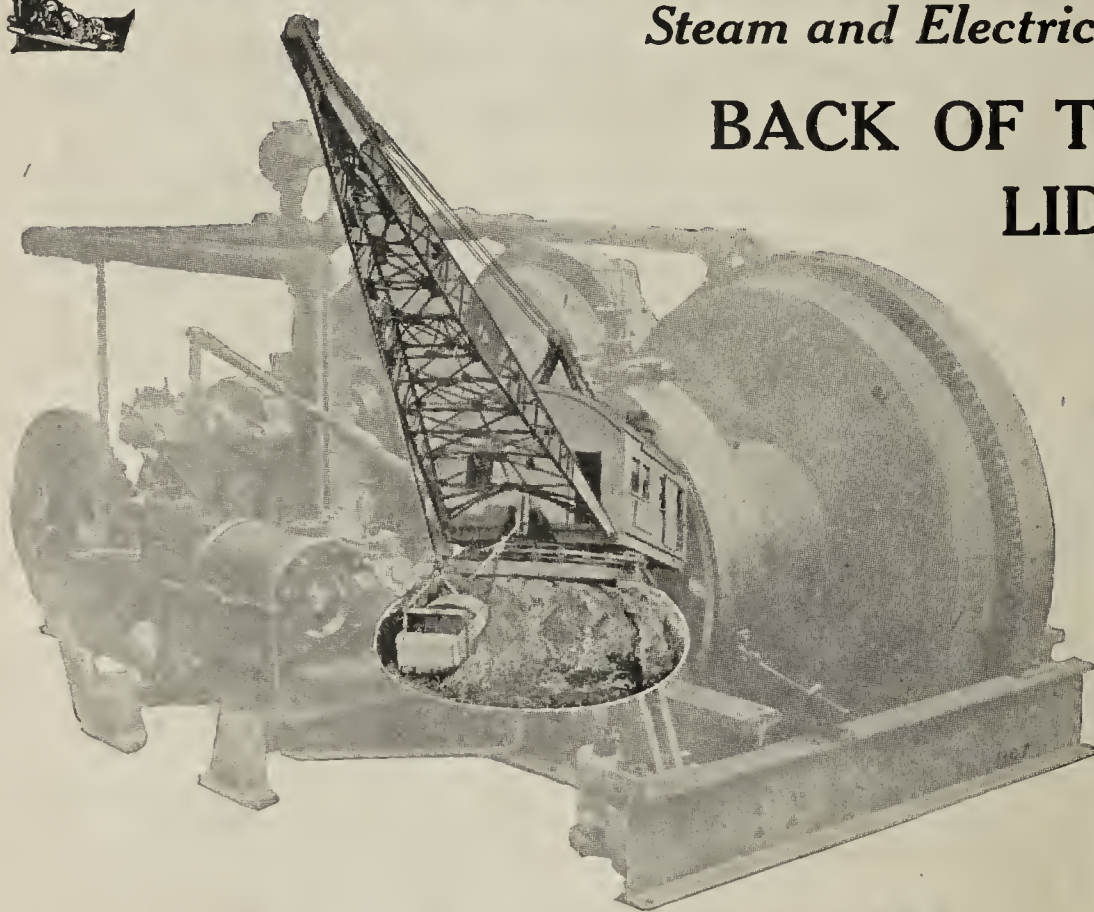
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There is strength in every detail of the excavator consistent with the power of the engine.

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Will operate grab bucket.

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CEMENT AND ENGINEERING NEWS

Vol. 27 TRANSPORTATION BUILDING, CHICAGO, SEPTEMBER, 1915 No. 9

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A $\frac{3}{4}$ " inside facing of Impervite mortar will waterproof any leaky cellar or pit.

Satisfaction guaranteed or money refunded.



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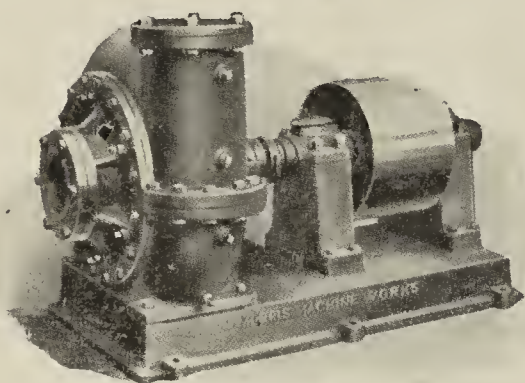
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Solid Lined

Dredging Pumps



EVERYTHING that enters into the construction of the Morris Solid Lined Dredging Pump is of heavy proportions and the general design is such that wear is reduced to the smallest possible extent. Its ability to outlast other dredging pumps is its chief claim to economy.

By removing the upper half of the pump shell, the lining can be taken out or by removing the disc on the pump shell and the inner disc on the lining, the runner can be taken out. The pump is easily and quickly taken apart if necessary to replace lining or piston.

*Write for Sand and
Gravel Pump Catalog*

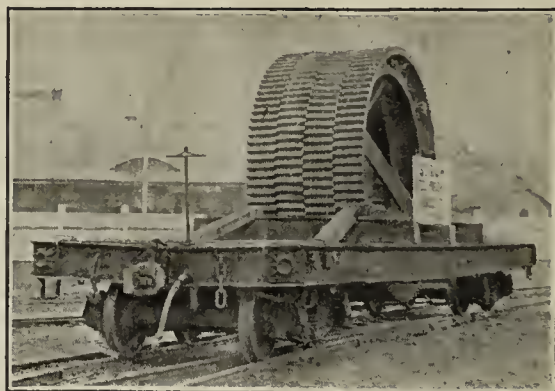
**Morris Machine
Works**

Baldwinsville, N. Y.

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HENION & HUBBELL, General Agts.
227 No. Jefferson St., Chicago

Stroh Process



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Pinions and Gears

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Crushing Plates

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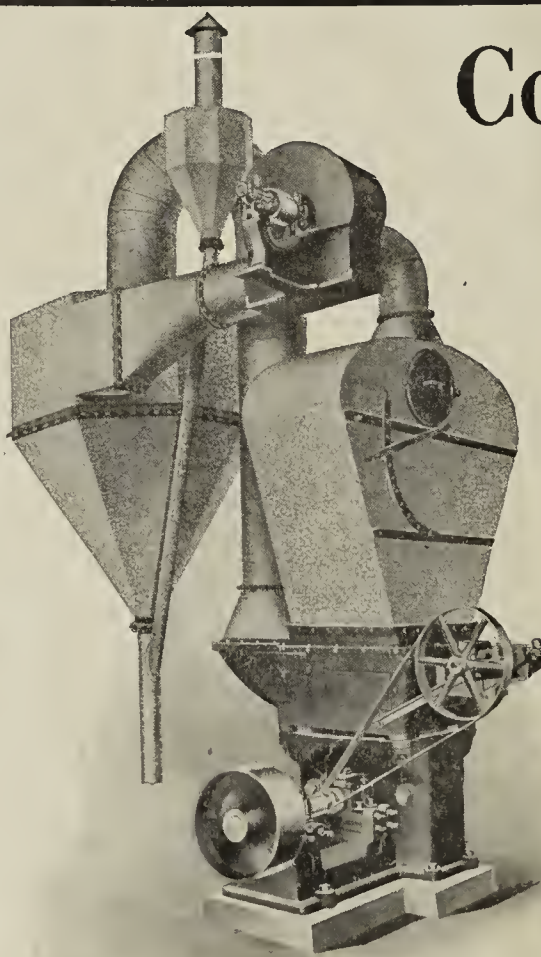


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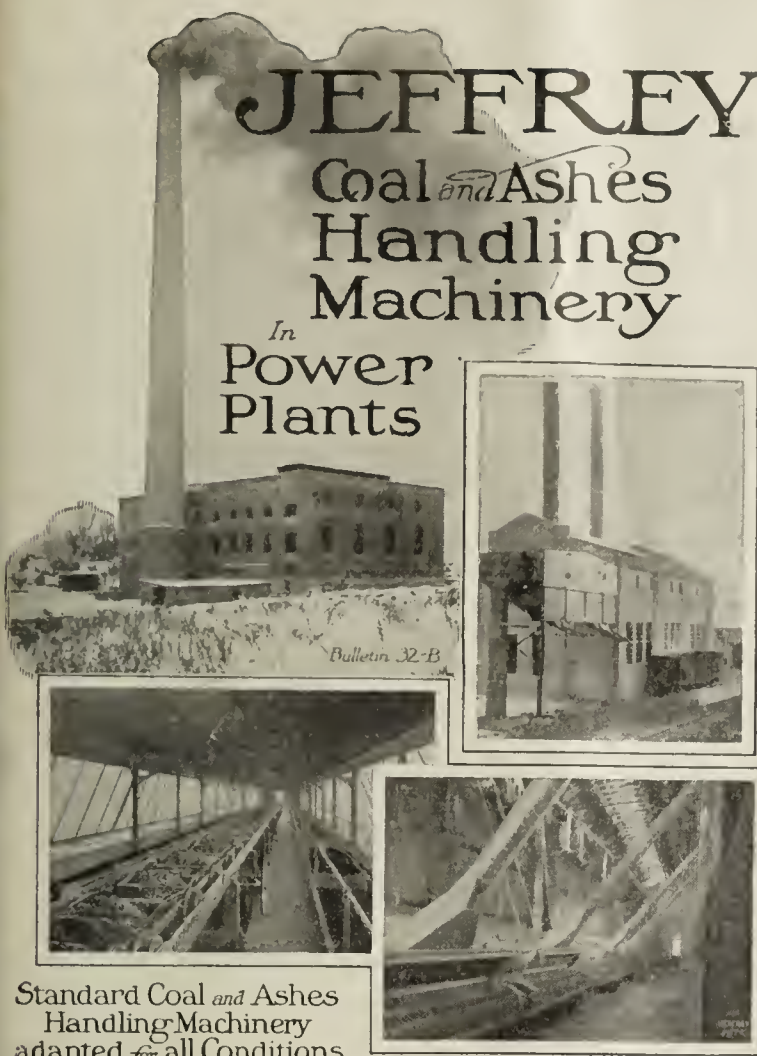
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You will be interested in seeing how we have solved the coal and ashes handling problems of others—return the coupon for free copy of Bulletin.

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Every EQUIPMENT illustrated and described in our Bulletin is convincing proof that

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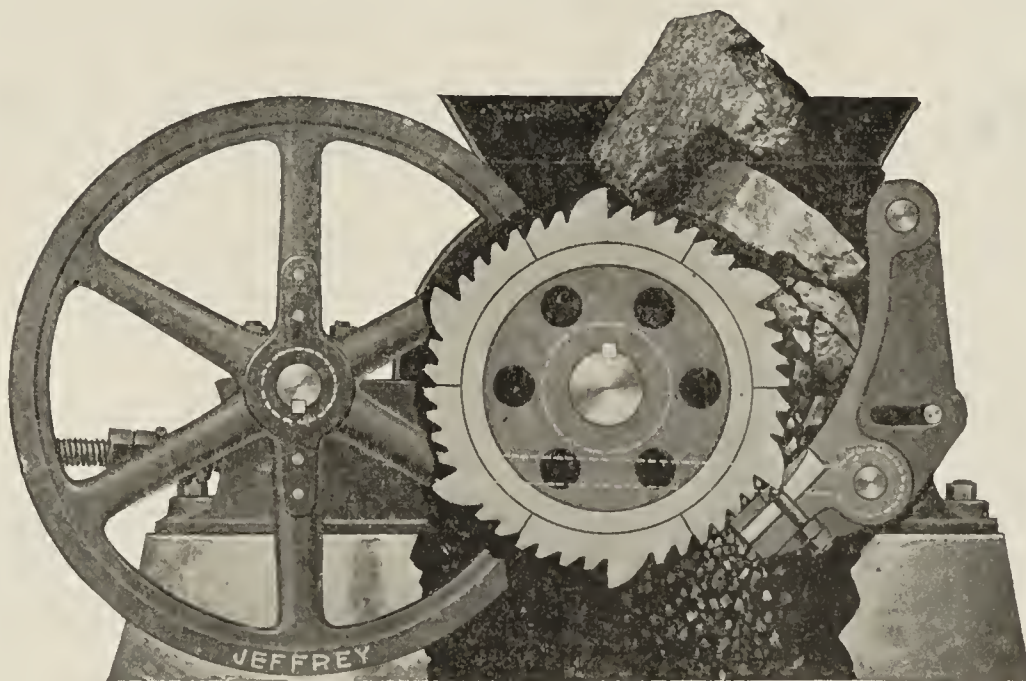
The simple construction, ease of operation and low cost of maintenance of the **Jeffrey Pivoted-Bucket Elevator-Conveyor** especially commends it for the handling of coal and ashes in power plants of medium and large capacities. It is also extensively used in **Cement Plants** for handling raw materials and clinkers.

The JEFFREY SINGLE ROLL CRUSHER

is the machine that rounds out the JEFFREY LINE for the Power Plant.

A Single Operation reduces Run-of-Mine or Lump Coal to 1" and under, the proved size for stoker use. Not only is maximum heat value obtained, but crushing costs are lower than any other method.

Built in four sizes with capacities from 20 to 250 tons per hour. More than 200 in use—and every one a success.



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We build a complete Line of Elevators, Conveyors, Screens, Crushers, Pulverizers, Power Transmission Machinery for

CEMENT PLANTS

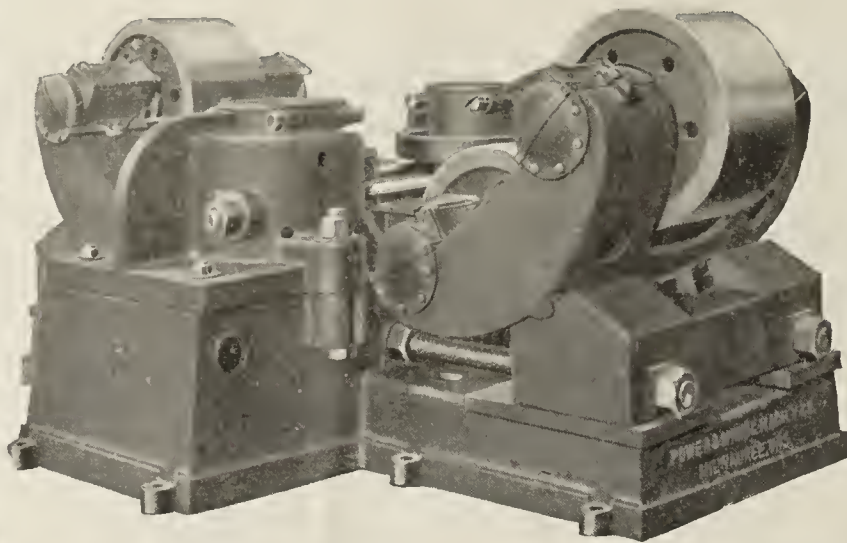
Ask for General Catalog No. 83-14

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Please send copy of Bulletins Nos.:
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Our Standard Design Kiln Supporting Frame

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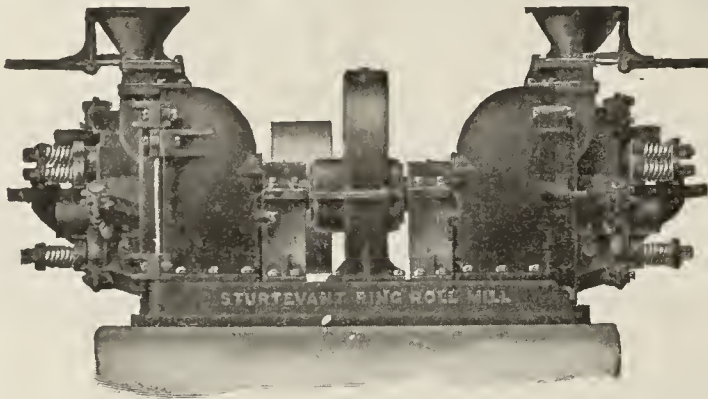
Power & Mining Machinery Co.

Works: Cudahy, Wis.

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District Offices:—New York, Chicago, El Paso, San Francisco

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For **CLINKER, LIMESTONE and COAL**
THE LARGEST PRELIMINARY GRINDER BUILT

CAPACITY PER HOUR ON CLINKER

80 TO 120 BBLs.	TO 20 MESH WITH	80 — 90 H. P.
50 " 80 "	" 40 "	" 80 — 90 H. P.
50 " 60 "	" 80 "	" 80 — 90 H. P.

UPKEEP APPROX. 1% C. PER BBL.

The Ring-Roll Tube Mill Unit can produce cheaper cement from every standpoint — upkeep capacity, low power and continuous operation than any other. Ask the users, they can prove it to you, and we can.

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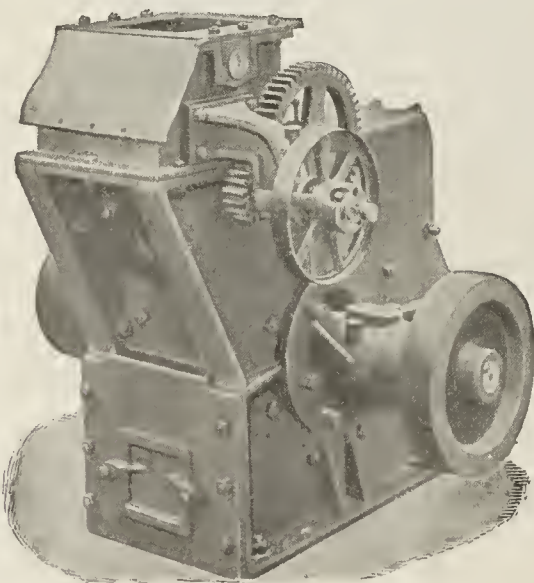
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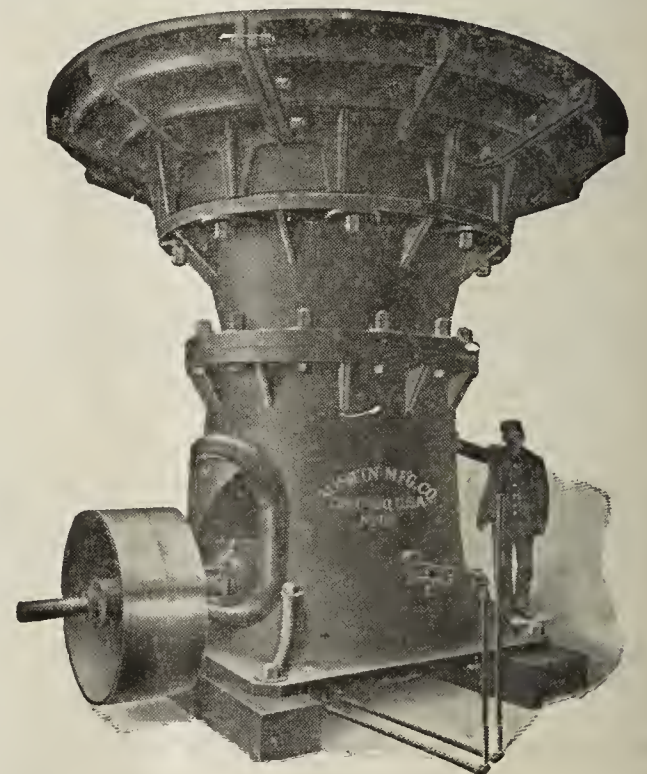
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Austin Gyratory Crushers



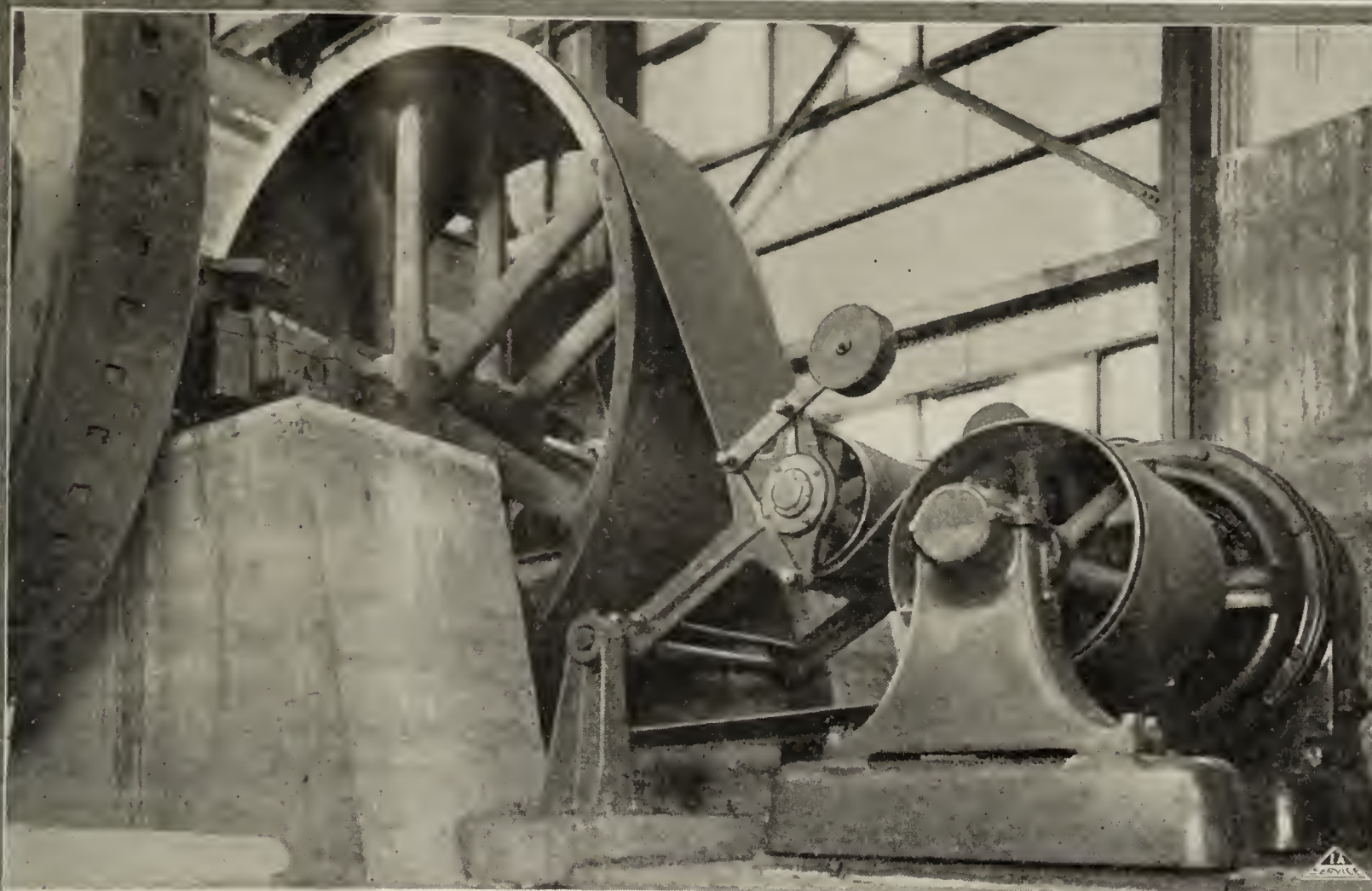
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It's mighty severe service—a thorough test of the merits of a belt. But Duxbak as usual comes through with flying colors. We'll be glad to supply full facts and figures on economics effected by the use of Duxbak. Awarded the Gold Medal of Honor at San Francisco Exposition. Highest award given for Leather Belting exhibits.



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Oak Leather Tanneries
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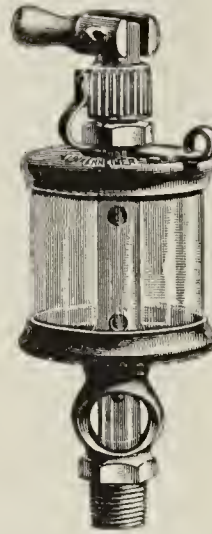
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High Grade Engineering Specialties
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\$1,000 Saved by using a Thomas Electric Hoist

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USE OF A THOMAS ELECTRIC
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Here-
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From calculations made at the close of our year's business, we find we have saved more than \$1000.00 in operating expenses in the items of fuel and labor alone, not including boiler repairs, oil and waste, grates, broken parts and loss of time from shut downs, which would run a few hundred dollars more. Heretofore we used steam for power altogether and have changed to electric since last February.

We have had no repairs whatever on our electric hoist and have used less than \$2.00 worth of oil.

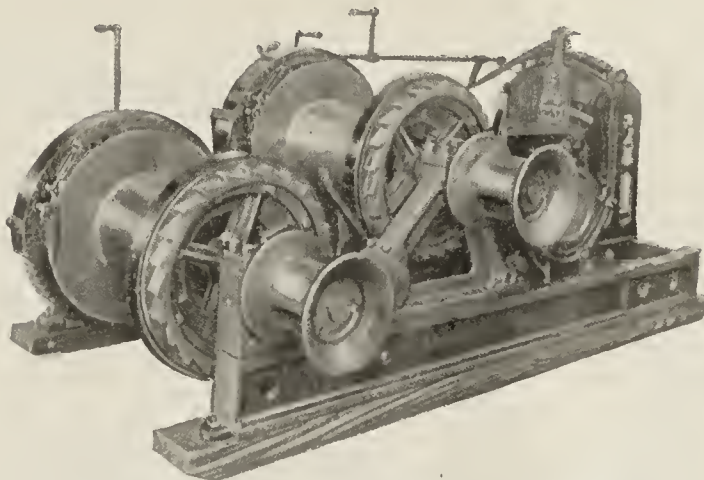
You may take the liberty to refer anyone to us.

Yours very truly

MAXWELL GRAVEL COMPANY

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Thomas Electric Hoists are
built to meet the requirements of speed, efficiency,
economical operation and
substantial construction
for all classes of work.



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THOMAS ELEVATOR COMPANY

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JOIN THE ARMY OF SATISFIED USERS OF ELECTRIC FURNACE STEEL CASTINGS

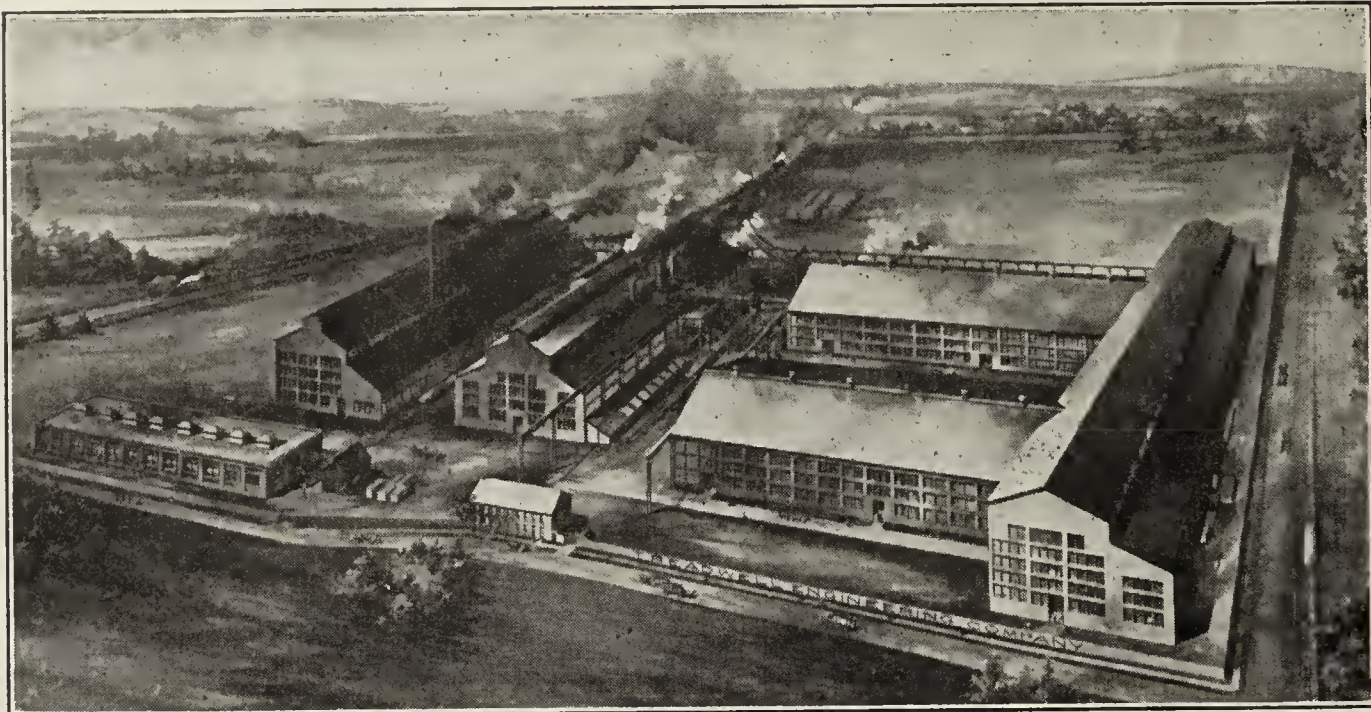
It's a self evident fact that the purer a steel the better its properties.
The *superior purity* of electric furnace steel *is unquestionable*. (See Iron Age, issue of April 23rd, 1914)

No oxides
No segregation

Low phosphorus
Low sulphur

High tensile strength
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Greatest resistance
to wear and fatigue



**Castings of Special Analyses
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Give 50% to 100% additional
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Designed to give greater output at reduced cost. This car will hold 25 per cent more than the 4-yard car, and is built to stay on the track. You save in loading and unloading on account of fewer cars required to handle the same amount of material. This new car is built on the same lines of our celebrated special or heavy duty 4-yard car, which is now conceded to be without a rival on the market.

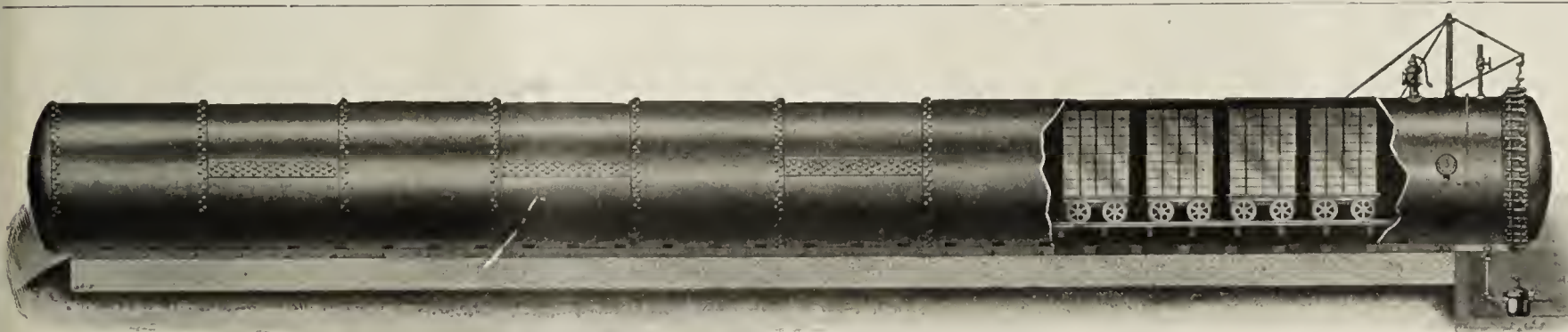
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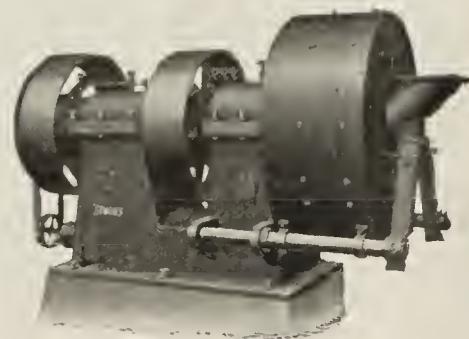
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Total	\$0.01598
Less extraordinary items.....	.00228
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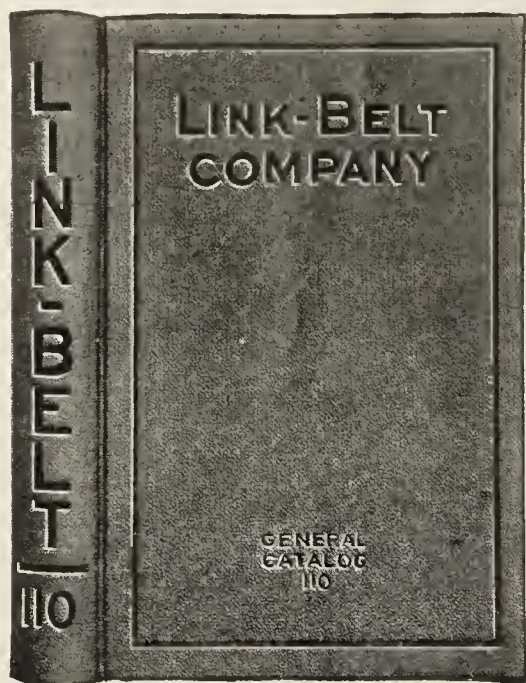


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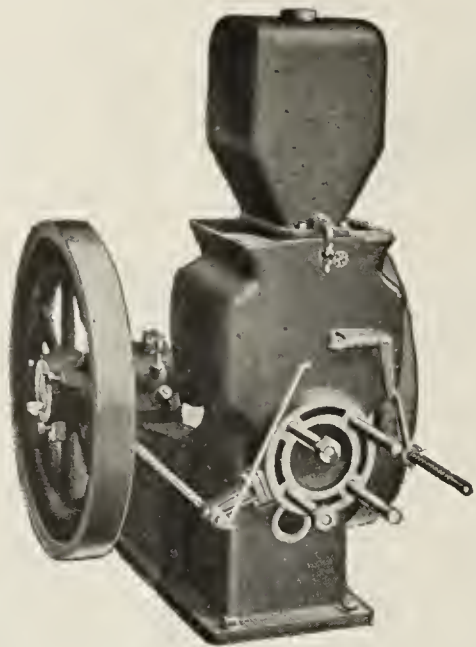
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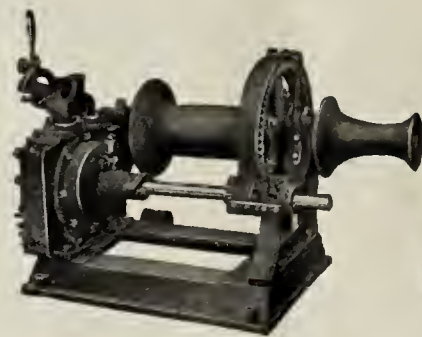
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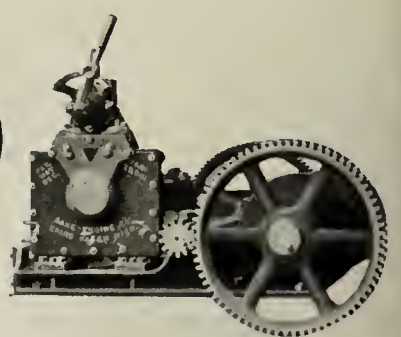
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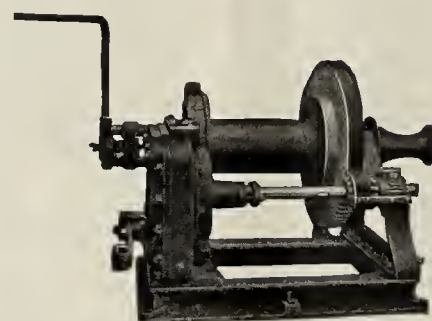
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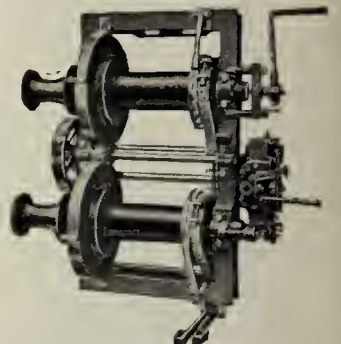
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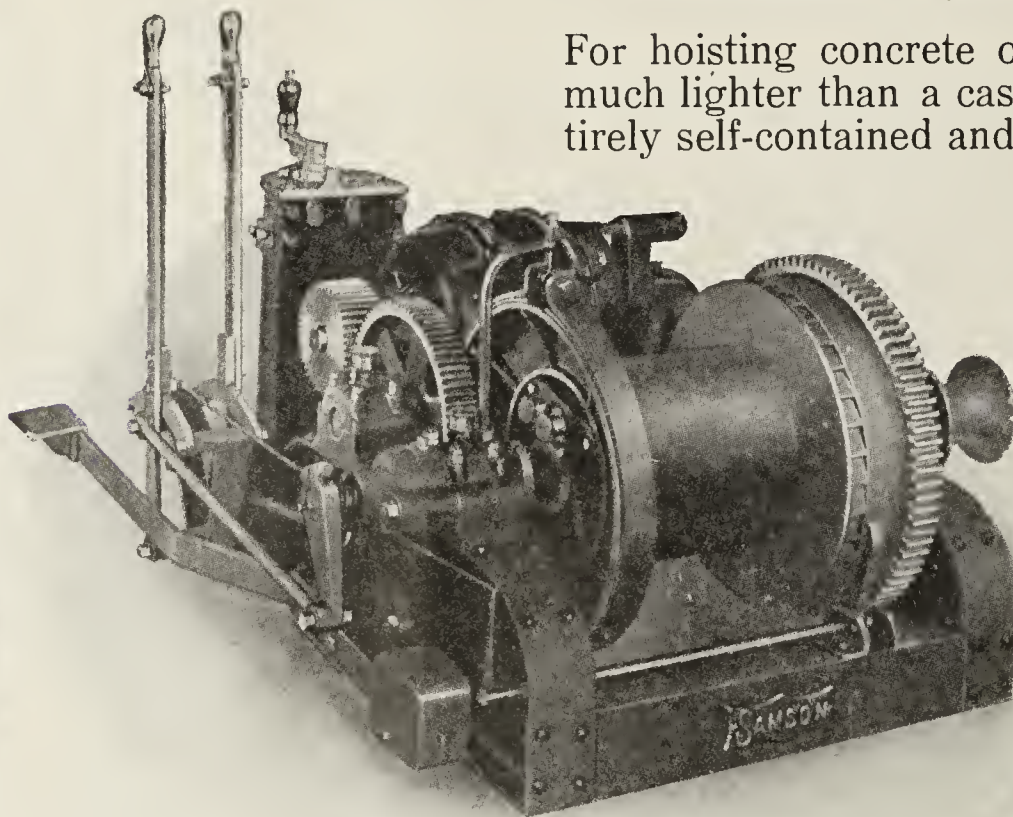
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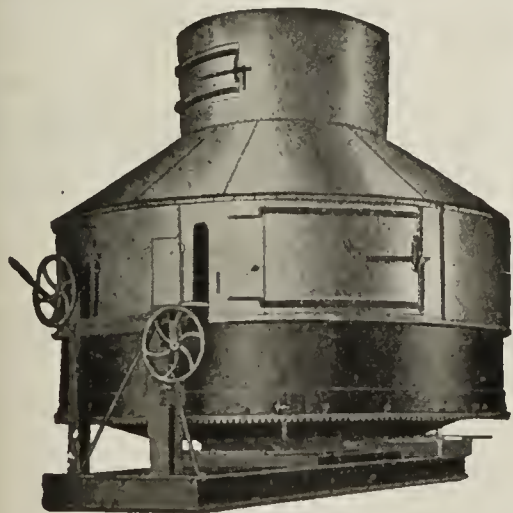
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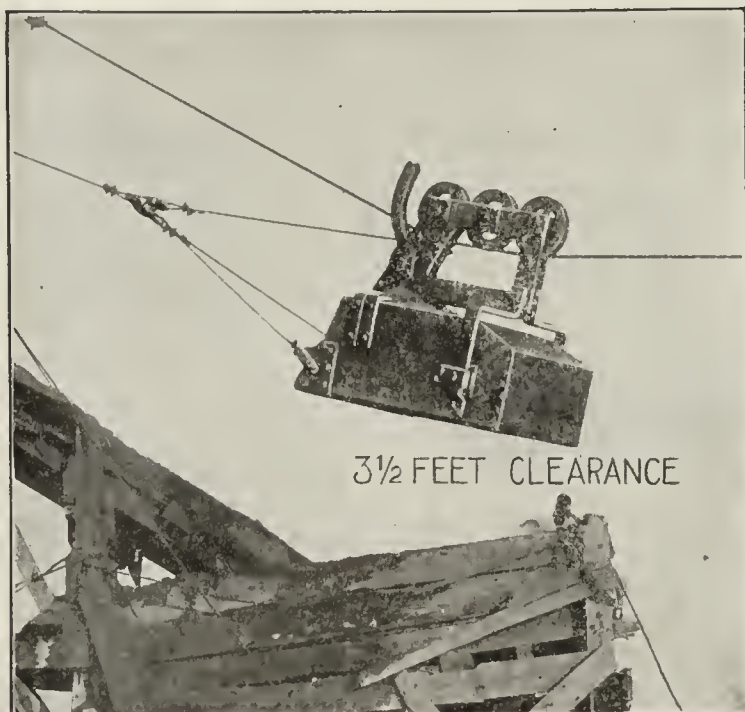


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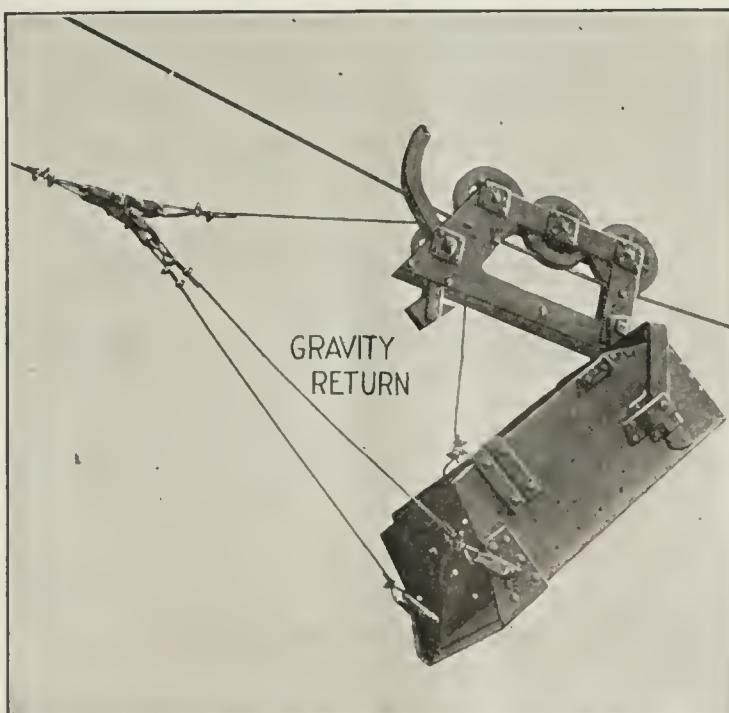
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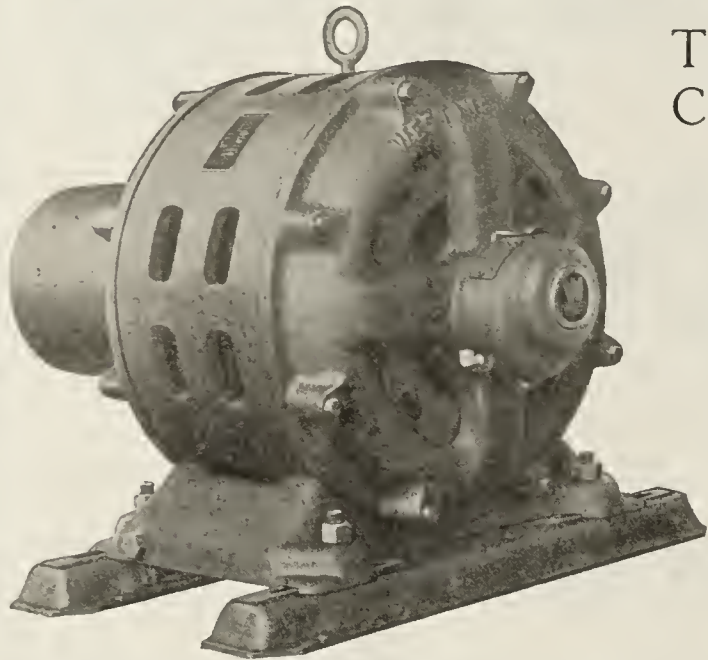
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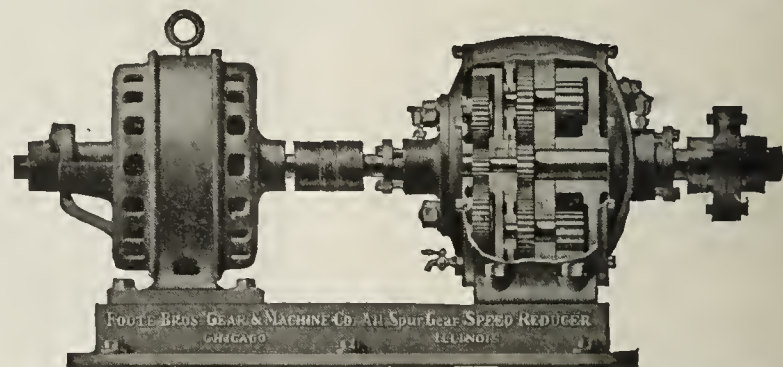
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CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

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CHICAGO, SEPTEMBER, 1915**PAN-AMERICAN ROAD CONGRESS.**

The advance program of the Pan-American Road Congress outlines the work to be followed at the ten sessions, which will be held at the Municipal Auditorium, Oakland, Cal., from the morning of Monday, September 13, until the afternoon of Friday, September 17.

The first session, Monday morning, will be taken up by the opening exercises. The opening address will be by Governor Gates of Vermont, chairman of the executive committee; addresses of welcome will be made by Governor Johnson of California, Mayor Davis of Oakland, and Director of Congresses Barr of the Panama-Pacific Exposition. Responses will be made by President Tillson of the American Road Builders' Association, and President Harrison of the American Highway Association.

Six educational addresses are scheduled for Monday afternoon. Both morning and afternoon sessions on Tuesday, Wednesday and Thursday, and that of Friday forenoon, will be devoted to the presentation and discussion of papers for bringing out the latest and most approved ideas in road and street construction and maintenance. Friday afternoon will be given to committee reports, business and resolutions.

Chairman Gates will be assisted by the following named persons, who will preside at various sessions of the Congress: Fairfax Harrison, president A. H. A.; George W. Tillson, president A. R. B. A.; Captain Walter Coggeshall, president Tri-State G. R. A.; W. A. McLean, chief engineer Ontario Highways; Judge W. S. Worden, treasurer Tri-State G. R. A.; James H. MacDonald of Connecticut, and W. D. Schier, chairman Massachusetts Highway Commission.

The program schedules twenty-one papers open to discussion. They have been prepared and the discussions will be led by men well known in road building circles and the committee has endeavored, so far as possible, to assign to each the subject which is within the scope of his greatest activity. In this way the most complete information may be brought out. After the paper on any subject has been presented and the

discussion opened by the person selected, remarks will be in order by anyone interested in the subject.

Acceptances of the subjects assigned by the program committee have already been received from about forty of those designated, and others are constantly being received. These acceptances cover practically all phases of road and street construction, maintenance and administration.

Many special local representatives of the Congress have been and are being appointed in different sections of the country. These representatives will supply information to all inquirers concerning details.

A special official train has been arranged, under the direction of J. Edward Eager & Co. of Baltimore, Md., which will leave Chicago, September 2, and arrive at Oakland, September 12. The train will go over the C. & N. W. railway to St. Paul, over the "Soo" line to the Canadian border, and then over the Canadian Pacific, through the Canadian Rockies to Vancouver, and to Seattle. The trip thence to Oakland will be over the Northern Pacific and Southern Pacific railroads. Stops will be made for visiting points of interest throughout the entire trip.

The Congress is to be held under the auspices of the American Road Builders' Association and the American Highway Association, acting jointly. These two great national good roads associations have heretofore held separate annual conventions. Assistance in details on the Pacific slope will be rendered by the Tri-State Good Roads Association and the Pacific Highway Association.

The executive committee of the Pan-American Congress consists of Governor Charles W. Gates of Vermont, chairman, Franklin, Vt.; Major W. W. Crosby, program, Munsey building, Baltimore, Md.; James H. MacDonald, finance, New Haven, Conn.; J. E. Pennybacker, arrangements, Willard building, Washington, D. C., and E. L. Powers, publicity, 150 Nassau street, New York.

In addition to delegates and others officially appointed by the heads of governments, states and cities, and a large number of state and local highway officials who have been invited to attend the Pan-American Road Congress, approximately five thousand contractors have received special invitation to be present and participate in the proceedings. Each of these contractors has been supplied with a copy of the advance program, and the rapidly increasing number of expressions of intention to attend the Congress is especially significant.

The attendance and interest of those who perform the actual work of construction of roads and streets has been noted at the previous annual conventions of both the American Road Builders' Association and the American Highway Association, and especially at those sessions which included the discussion of practical or technical construction. The fact that this year these two great associations have joined forces in organizing the Pan-American Road Congress, with its comprehensive program, and with expert road builders and engineers of the highest standing to prepare papers and lead discussions, makes it certain that the latest and most thoroughly scientific information will be presented, the value of which cannot be overestimated.

Contractors and all others interested will be entitled to participate in the proceedings; and on the payment of a small fee, if desired, receive a copy of the complete report when printed. This report, containing the papers and discussions in full, will constitute a virtual text book on road and street construction, maintenance and administration, with the methods and practices brought down to date.

Advantages of Steel Forms

By C. D. MacArthur*

There is no single piece of plant equipment used by the contractor which lends itself more to the completion of good concrete work than the forms. We very often find a greater amount of neglect of them than of any other part of the plant. Going back over past projects wherein concrete has been used, with the aid of forms, we find a great waste of time and materials, and are convinced that not enough thought is given to the proper design and handling of this part of the work. With a great many contractors today, forms are the last things thought of. An item covering them is to be found in their estimates, but many times no real knowledge of the subject is displayed in making up this item.

There are many pieces of concrete construction which do not require special forms, but can be done with almost any kind of makeshift. But a piece of work requiring forms to be moved and re-used a number of times is important enough to warrant the contractor looking into the most economical method of handling this item.

It is the duty of the designing engineer to study the most economical method of building the structure he designs. By doing this, he could greatly reduce his cost, for it is the ability of being able to work his plant to the best advantage that enables the contractor to make his lowest figure and do his best work.

As I go over many designs I cannot help criticising the designing engineer for paying so much attention to the theory of design to the neglect of practicability. I do not want him to give up his deep-rooted principles and formulas, nor to part with his originality, but if he would pay more attention to the standardization of details and the duplication of parts, he would greatly reduce the general cost of the structure he has designed.

I could cite many cases where the cost of forms could have been reduced had the designs been studied a little more closely with a view of reducing each construction item to a minimum.

The designing engineer should keep in mind that his value to his client is his ability to design a staple structure on the most economical scale, and it is the duty of the form designer to point out to him and to design for him a form whose use can be duplicated so often that it enters into the construction of his work as the most important tool.

In a recent work on Concrete Costs the author says that "the greatest trouble met with by the estimator is the lack of knowledge of what is a fair cost of the labor, and especially of the comparative costs of different parts of the same work." He also observes that "the variations in form costs and the difficulty in estimating them are apt to play havoc with the estimates and determine the amount of profit, or frequently of loss, in building of reinforced concrete structures."

We find few contractors or estimators who can give accurate costs of the forms on a great amount of their past work. It is a hard proposition to convince a contractor that steel forms are the ones to use when the first cost of the form is invariably higher than wood forms, unless he has given a great deal of attention to accurate form costs and knows that the life of a wood form cannot be compared with that of steel.

There is no doubt that the form manufacturers are to blame in many cases for the adverse opinion of steel forms. The reason is that they have been overly

*Chief Engineer Blaw Steel Construction Co.

anxious to place steel forms on every concrete job that comes along and have therefore placed a great many forms on jobs that did not warrant the use of steel.

House building with an all-steel form is today out of the question. Good steel forms have been developed for constructing light walls, such as are found in house construction, but to set up a form and pour the house in one operation is so far from being a reality that it seems almost a joke. There is no field of construction where individuality is displayed more than in building a house, and for that reason a machine-made house is not yet a commercial success. Past performances have not shown that steel forms can be used successfully in the construction of workmen's houses unless the work is carried on in stages by a limited supply of forms.

The steel form has become one of the most important adjuncts to the concrete plant and no contractor can successfully conduct all of his work without giving serious consideration to their use. No single piece of apparatus has made a greater impression on the contracting world. Many articles relating to tunnel construction, aqueduct building, sewers and concrete costs are being published with only a passing glance or no reference at all to the steel forms which, no doubt, played the most important part in their construction. The publisher's point is that generally the steel forms, being a patented article, cannot be advertised too much in the reading matter of his paper. That may be true, but his paper serves his subscribers best by diffusing as much exact knowledge as possible, and the contractor is in demand of all the data he can get about the work in which he is interested. The steel form industry is here to stay, but the manufacturers must not try to overdo it by trying to lead the contracting engineer to believe that all concrete work must be constructed with their product. A few hard, cold facts must be understood before all branches of the concrete contracting industry will be benefited:

First—Uniformity of concrete design, of which I have already spoken. Second—The development of standard designs of steel forms for various classes of work, such as sidewalk construction, columns, beams and girders, walls, sewers, etc., which can be leased to the small contractor at a low rental price or sold outright to the contractor whose business warrants their purchase on work at hand or desires to place them in his equipment as a part of his plant.

The rental method of placing forms at the disposal of the contractor is the most profitable to the manufacturer as well as to the contractor, as it allows the manufacturer to get good profits on his first cost of production by re-leases, and it enables the contractor to get the use of the forms for his work at a much lower figure than if he purchased them outright.

The third fact is that the contractor should content himself with the design of form which can be had from the manufacturer under a guarantee that it will do the work required of it and let the smaller details of construction pass, as he is very apt to impose conditions which will greatly increase the form cost, but which will be of no real value to his work.

A case of some note happened a few years ago in New York state on a job involving millions, where the engineer of the contractor conceived the idea that the forms already on the work were not strong enough and could not be handled at a low enough cost. The settlement of the matter resulted in the removal of the first set of forms and the replacing of

ame by heavier forms made by the same form builder at a cost to the contractor of several thousand dollars in addition to the cost of the first set. How did it result? The second and heavier set of forms were used and moved at a cost above the cost of moving the first set, and the first set was transferred to another section of this same project and used by another contractor with great success.

An impression seems to prevail among contractors who have not used steel forms that they should be erected and handled without visible labor, and that they can be moved without thought or energy. I grant that if the ease of handling steel forms was not greater than wood forms they would not be used in many cases. But there are other reasons why steel forms should be used; an important one is the life of steel form. A form to be of any value must cast as good concrete the last time it is used as it did the first time. It is almost impossible to get many moves from wood forms before they begin to show their age on the surface of the concrete, or before they require additional work to keep them in shape. Not so with steel forms. A good, well designed steel form is good for several hundred moves. I have seen steel forms after two hundred moves cast a surface so smooth that it would reflect light. If the inspection of the work will permit the surface of the work being left in the rough state gotten with wood forms when every grain of the wood shows, there is no use dwelling on the virtue of the smooth surface obtained by the use of steel forms; but if the contractor is to have the surface as smooth as possible he should seek the form which will give him the best result from the start.

The designers of steel forms must keep in mind that it is simplicity, rigidity and economy of handling that makes their product of value.

Simplicity implies that the forms must be capable of being moved and handled with least amount of skilled labor, and by the least amount of any kind of labor. This can only be accomplished by making all parts interchangeable, so that no searching for special parts is required. This applies more to forms that are placed on the market as a standard, such as sewer forms, house forms, sidewalk forms and forms of like nature.

Rigidity forgotten has caused many a form to give away under its load and ruin the concrete. It matters not how simple the design is, if the form is too light it is of little or no value. Wall and house forms must be able to take all pressures placed upon them. With the rods spaced at intervals the pressure must be evenly distributed so that no bulging of the plates occurs. This can only be gotten by having the tie rod receive its load from some important member which in turn received its load from the plate. In case of sewer forms of the arch design, they can be lighter per surface foot than any other type of form, but not too light to distort under load.

PROPORTIONING CONCRETE

By Louis D. Kelsey

The following article describes in a general way the method adopted by the city of Aberdeen, Washington, in the proportioning and checking of materials used in the construction of concrete pavements and concrete sidewalks.

In all the concrete pavements and sidewalks laid in this city, only screened sand and gravel have been used. This material is obtained from the bed of the Chehalis river, and the pit material is screened and washed before delivery to the scow.

Our pavements are all of two-course construction, consisting for the most part of a six-inch base and a two-inch top. The base contains enough water so that, when well tamped, the surface will flush and none of

the mortar will be taken by it from the top course after it is placed. This base also makes a solid body upon which the workmen can walk in spreading the two-inch top, doing away with any chance of the workmen tramping holes in the base and allowing them to fill up with the surface mortar, thus insuring us a straight two-course pavement. The top course is mixed as a very soft mortar that is easily rodded to the shape of the crown desired.

In our lower course we call for one sack of cement (94 lbs.) to be used in each twelve square feet of six-inch base in place. This is based on one sack of cement to each six cubic feet of mixed concrete, sand and gravel to be proportioned as three to five, or as directed. The "as directed" clause is placed in our specifications for the reason that our materials vary as to fineness, making it necessary to often shift our proportions of sand and gravel as they require.

In our two-inch top course we call for one sack of cement in every 14½ square feet of two-inch top in place, aggregate mixed one sand to two pea gravel, or as directed.

The inspector can, by checking the sub-grade and keeping the base and top to the required thickness at the time they are placed, compute the amount of cement used against the amount required under the specifications. On the work where a boom mixer is used, the inspector takes a check on each move of the mixer, which is about every twenty feet.

In our concrete sidewalk construction we call for one sack of cement to be used in each twenty-four square feet of 3½-inch concrete base in place, aggregate proportioned one sand to two gravel, or as directed. This is based on one sack of cement to each seven cubic feet of mixed concrete. In place of calling for a straight proportion on the one-half-inch top for sidewalk work, that is, one cement to two sand, we limit the contractor to one sack of cement (94 pounds) to be used in each 15½ square feet of sidewalk in place, top and bottom included; the top to be composed of sand and cement in such proportions as will not exceed the limit as set in the specifications for the distance that one sack of cement will run. For the most of the sands which we have used, we have found that this is very close to a one to two proportion.

This system of specifying how far a sack of cement shall run in concrete pavement and sidewalk construction, we have found, has some good advantages from an engineering point of view.

First: We have found that we can handle a job with only one inspector, whereas in many cities using the other method of mixing—that is, straight proportions—they are using two inspectors, one at the mixer and one at the grade where the concrete is being placed.

Second: From this method of specifying, the contractors, in making up their bids, can compute the amount of cement that is actually required on any certain piece of work, and it also guards against the contractor shaving his price at the time of letting the contract on the theory that he can run a leaner mixture than is called for.

Third: The inspector on the work, after once adjusting the proportions of sand and gravel desired, has as his duty the watching of the cement, the empty cement sacks, the sub-grade and the placing of the concrete, and by measuring up the base at intervals, can at once detect any change in the proportions of sand and gravel.

During the last two years we have placed some 26,000 square yards of two-course concrete pavement and 17,000 square yards of concrete sidewalks under this type of specification, and we find that this method is giving us good satisfaction.

New Plant of the New Haven Trap Rock Company

The New Haven Trap Rock Co., of New Haven, Conn., has recently opened quarries and constructed a stone crushing plant at Totoket Mountain, North Branford, Conn., nine miles east of New Haven. This plant has just been placed in operation and is now supplying stone to the market. Crushed stone can be transported by water to the New York market.

Quarries.

The land owned by the company and available for quarrying consists of about six hundred (600) acres on Totoket Mountain. This mountain, several miles in length, consists of sand stone covered with a trap sheet 150 feet or more in depth. As shown in the cut herewith, the quarry is developed to the west of the crusher house and a face 50 feet in height and 5,000 feet long has been opened and equipped with Marion steam shovels, manufactured by Marion Steam Shovel Co., Marion, Ohio, for handling rock.

before. The rock is loaded into cars of standard gauge and brought to the crusher plant down a two per cent grade with forty-five ton Vulcan locomotives.

Crusher House.

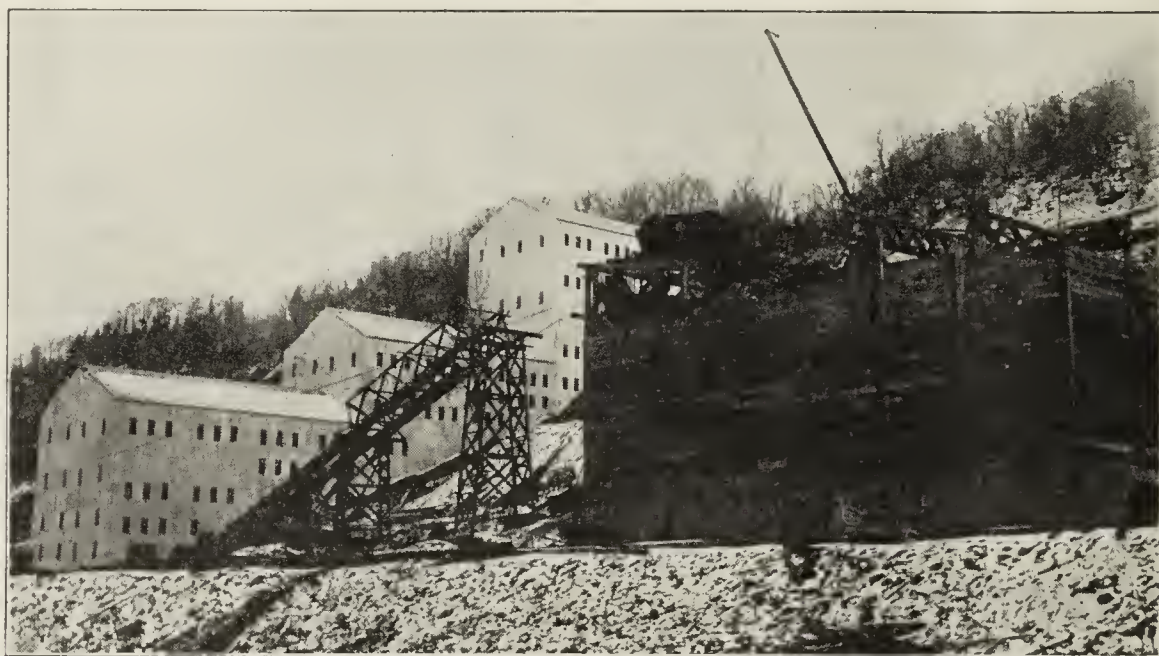
The crusher house is located on the side of the mountain in the sand stone just below the trap sheet, as a large amount of rock had to be excavated for the plant; this location proved very economical for construction, as the sand stone was soft and easily removed.

This building, forty feet wide by two hundred ten feet long, is constructed entirely of concrete and structural steel. The crushing and screening equipment consists of:

One jaw crusher with opening 48" by 72".

One No. 10 Gates gyratory crusher, made by Allis-Chalmers Mfg. Co.

Four No. 6 Gates gyratory crushers.



New Crushing Plant of the New Haven Trap Rock Co.

The crushing equipment consists of a jaw crusher with opening 48"x72", operated by 250 h. p. motor, driven by a 30" wide double Duxbak Waterproof Leather Belt, manufactured by Chas. A. Schieren Company of New York. The Duxbak Belt is running on a Lenix Drive and the motor and crusher shafts are placed on only 10-foot centers. The crushing equipment also consists of one No. 10 Gates gyratory crusher and four No. 6 Gates gyratory crushers, manufactured by Allis-Chalmers Mfg. Co., and two Symons disc crushers manufactured by Chalmers & Williams, Chicago Heights, Ill. Marion steam shovels are used in the quarry.

The drilling is done with both steam and well drills and the rock is blasted in sizes easily handled with steam shovels. The output of the quarry is limited only by the number of steam shovels that can be operated on a quarry face of this length.

Drilling.

Most of the drilling is done with steam drills. The method is to drill horizontal holes, called snake holes, at the quarry floor about thirty feet deep and ten feet apart. These holes are then sprung with dynamite until they are sufficiently large to hold enough dynamite to blow down the rock above. After twenty holes are sprung they are loaded and shot at once with 60% Du Pont dynamite. A large amount of rock is brought down ready for the Marion steam shovels to load into cars. Practically no extra drilling or blasting is required after the rock is down. Two distinct quarries are maintained though both are on the same level. The intention is to take off a layer fifty feet in height over the entire area; another quarry floor will then be made fifty feet below and the operation continued as

Two Symons disc crushers, manufactured by Chalmers & Williams, Chicago Heights, Ill.

Five friction driven revolving manganese screens 60" by 16', with dust jackets.

Two friction driven revolving manganese screens 48" by 16', with dust jackets.

Two pulsating screens.

Cycle of Operations.

The cars loaded with rock are carried into the building on steel girders and all the stone is dumped into the jaw crusher, where it is reduced in size to 10" and under. It then falls by gravity into the No. 10 Gates gyratory which reduces it to 5" and under. From this crusher it is carried by an incline belt conveyor to a scalping screen which removes any stone already broken to market size. The tailings from this screen are carried by a belt conveyor over a battery of four No. 6 Gates gyratory crushers which reduces practically all the stone to market sizes. A third conveyor carries the stone from here to a pair of scalping screens placed in parallel, which remove all stone crushed

o marketable size by the No. 6 Gates gyratorys. The tailings from these screens fall into two Symons disc crushers from which it can pass only after being broken as finely as desired.

The commercial stone removed by the second scalping screens passes by means of a chute to the main conveyor leading to the screen house. The stone removed by the first scalping screen is carried by another conveyor on this main conveyor and the stone from the Symons disc crushers is also collected on it.

Screen House.

The screen house consists of a wooden bin 100 feet long, 35 feet wide and 30 feet high and is divided into compartments each of which contains a commercial size of stone. The stone is carried from the crusher house by the main inclined conveyor to two screens placed in parallel above the bins. These screens remove all the stone which will pass an $1\frac{1}{4}$ " ring and leave as tailings $1\frac{1}{4}$ " stone from the jackets and 2" stone from the main screen. These tailings fall into the first two compartments. The stone smaller than $1\frac{1}{4}$ " is carried by another conveyor to two other revolving screens located further along the screen house.

The jackets of these screens have holes $\frac{3}{8}$ " in diameter for the first half of their length and $\frac{5}{8}$ " diameter along the second half. All stone passing through the $\frac{3}{8}$ " holes falls upon the pulsating screens, one located under each revolving screen. These clean the stone and separate the dust and dirt from the $\frac{1}{4}$ " stone. The $\frac{5}{8}$ " holes in the jackets remove the $\frac{1}{2}$ " stone and the tailings from the screen give 1" stone and from the jacket $\frac{3}{4}$ " stone. The seven revolving screens are manganese steel throughout. The first five are made from the same pattern, the only difference being in the size of the holes in the screen plates. Each screen is equipped with a dust jacket in which the holes are smaller than those in the main screen. This greatly increases the capacity and efficiency of screening.

In taking the stone to and from conveyors care has been taken to make stone fall on stone, rather than on steel chutes, in order to minimize the wear. All skirt boards are free from contact with the belts and are held in place by braces fastened to the stringers below the conveyors. It should be noted particularly that there is no return of the stone to a crusher, screen or belt through which it has once passed and that the progress of the stone is continually forward, to lessen as much as possible the power required. There are no elevators of any kind in the plant.

The plant is so designed that the entire crushing outfit—eight crushers—can be duplicated at any time within the building and without moving a single crusher from its present location. This would seem to indicate that the building as constructed is much too large but close observation does not bear this out.

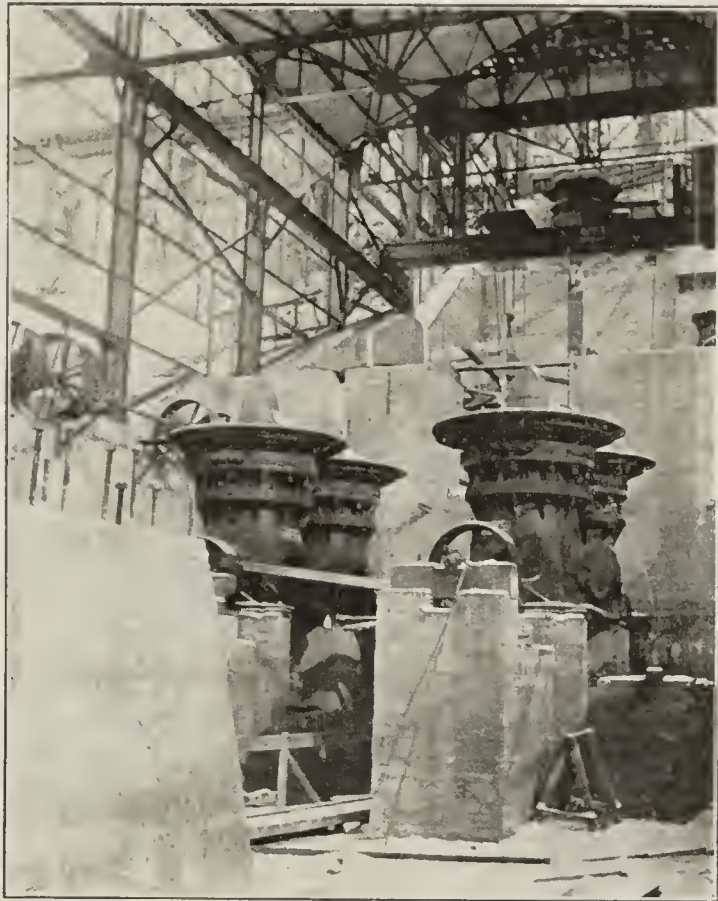
On account of the continually forward movement of the crushed stone through the crushers and screens the output is greatly increased, as no tailings are brought back to the crusher. The opening in the crushers can be so adjusted that if one crusher becomes overloaded and flooded with stone the other crusher can be closed or opened to equalize the work. This gives maximum capacity for all crushers.

Should the initial crusher be out of commission the stone can be fed direct from the quarry cars to the No. 10 crusher. Should the No. 10 be out of commission the stone can pass from the initial crusher to the four No. 6 crushers. The screens can also be operated singly or in pairs, as production requires. It should be noted that it would require a series of accidents to put the entire plant out of commission, as any crusher can be by-passed.

The storage bins in the screen house have a capacity of three thousand yards. The stone from the bins

can be placed directly on railroad cars by chutes at the side of the bins or by means of a belt conveyor running in a tunnel under the bins. By this latter method the bins can be more completely emptied.

A gravity yard with capacity for forty standard gauge railroad cars is located to the east of the screen house. From here the empty cars drop down to the screen house, are loaded and passed over track scales to a lower yard of equal capacity for loaded cars. From here trains are run over a standard gauge railroad six miles long, built by the company, to the storage bins at tide water, or to a ground storage of unlimited capacity near it. Connections are made with the N. Y., N. H. & H. R. R. and with two trolley companies for rail shipments.



The Crusher Building, Showing the 4 Gates' Crushers

The tide water plant consists of bins of about four thousand cubic yards capacity, belt conveyors for loading scows, a basin sufficiently large to hold a fleet of scows and a dredged channel to deep water.

Power.

The electrical power employed is purchased in New Haven and transmitted on a private transmission line seven miles to the plant, at 6,600 volts, 3 phase, 60 cycle, alternating current.

The main switch board is located in a small building outside the crusher house. A Watthour meter, an ammeter and a voltmeter, all of the recording type, are placed on the main panel to measure the power.

Each individual motor is further supplied with an ammeter to measure the power consumed by it. The lightning arresters and transformers are out-door type, located near the switch board and only low voltage, 550 volts, is carried into the crusher and screen houses to the motors.

These motors are the slip ring type with outside dust proof collector rings and three bearings on all motors over 100 H. P.

Motor Equipment.

The motor equipment consists of one 250 H. P. motor, three 150 H. P. motors, one 100 H. P. motor, one 75 H. P. motor, one 35 H. P. motor.

The aim has been throughout to group the machinery as much as possible in order to use larger and fewer motors and make them as nearly interchangeable as possible. The plan shows the location and drives of each motor.

The initial jaw crusher requires about 200 H. P. to operate but in cold weather and under unfavorable circumstances, as when starting under a load, will sometimes require considerably more. Consequently a 250 H. P. motor was installed here and part of this power is used for the first scalping screen and two conveyors which must run empty until stone is passed through the jaw crusher and it is well started. Owing to the nature of the ground it would have required considerable rock excavation to have placed this motor at the customary distance from the shaft of the crusher. A Lenix drive, perfected by the F. L. Smidth & Co., New York City, is installed here and the motor and crusher shafts are placed on only 10' centers. This Lenix drive is essentially a counter weighted idler which rests on the slack side of the belt and greatly increases the arc of contact on both pulleys. A 30" wide double Duxbak waterproof leather belt manufactured by Charles A. Schieren Company, 30-38 Ferry street, New York, N. Y., is transmitting the power from the 250 H. P. motor to the jaw crusher.

All belts, jack shafts, gears and pulleys are standardized and as few different sizes used as possible in order to carry a minimum number of duplicate parts in case of breakage.

Water Supply.

Considerable water is required around the plant and for the steam used for shovels and drilling in the quarry. This is supplied by a pump located on low marshy land about a mile from the plant. Electric power is stepped down from 6,600 volts to 2,200 volts by a small transformer at the crusher house and carried to the pump, where it is further stepped down to 220 volts for operation.

Preston K. Yates, consulting engineer, New York City, was engaged to design the crushing plant and to develop the quarry. Mr. Yates had entire charge of erection, which was done by day labor selected from the entire organization of C. W. Blakeslee & Sons of New Haven, Conn.

Much credit is due to Mr. Clarence Blakeslee, an official of the New Haven Trap Rock Co., and to Sheldon S. Yates, principal assistant engineer.

CALL OF THE CONCRETE SILO

I am the Concrete Silo, the potentiality of a permanent American agriculture. In me there are vast possibilities for good, because my power will eventually overcome the low-yield-of-farming, which is responsible for the strongly entrenched high-cost-of-living and which has hitherto defied the attacks of all others. I am to corn what the lowly tin can is to the great fruit and vegetable crops, a savior of the surplus, an enemy of waste. The little tin can makes it possible for the housewife to serve the fruits and vegetables of summer in the dead of winter; when snow is flying I hold within my smooth and rounded sides all that summer means to live stock. I am acres of lush, green pasture stood on end; I am waving corn fields, taken stalk by stalk, chopped into little bits, compacted together, and held secure against fire and frost into the season of no green growth. I am the dairyman's delight, the feeder's friend, the personification of corn conservation, the exemplification of getting out all there is and putting it to use.

In me, science and practice have at last met. The scientist tells the farmer that he needs me; and the farmer knows that the truth has been spoken, for practice has proven it. Not before, since the first scientist wondered why things grow, and watched them in order to learn their secret, have the agricultural scientist and the practical agriculturist been in

complete accordance. I am the perfect application of a fundamental principle. Nature's unyielding law is that production shall dwindle where waste continues; but where I stand, the land stays fat while the cattle fatten. I am the lighthouse of the land. Where I am, there is safety for investment. I displace broad acres of bunchgrass range. I round out the cycle of corn, cattle, and concrete; I make possible the cycle of cotton, corn, cattle, and cash. I am the milestone on the farmer's road to wealth, and men date their prosperity from the day the concrete silo was first filled.

I lack but one thing, the assistance of men that I may be multiplied in the land. On every hand they call for me and preach by manifold perfections. The editor of the agricultural paper, from his sanctum; the scientist, from his laboratory; the demonstration agent and the farm expert, from the platform; the experiment station director and the agricultural college professor—all cry to the American farmer: "You need a concrete silo; you must have it to be permanently prosperous." "Sure," says the farmer, "I know it; bring it on; the money is ready." Right here is where they stop, and, in the language of the slangsters, "pass the buck" to the concrete contractor. "Build it yourself," says the editor, "here's how to



Monolithic Concrete Silo Built with Polk Forms by Contractor G. W. Quick, Tiskilwa, Ill., for E. R. Allen, Sheffield, Ill.

make the wooden forms." "I am no silo builder," rejoins the farmer, "my job is to grow the corn to fill it." "We will loan you a crude set of forms," says the Agricultural College, "but there are a thousand applicants ahead of you."

My progress is impeded, and the forward march of agriculture halts, while concrete contractors slumber over their opportunities to make money. Over my problems of construction, men have labored—engineers at their drafting boards, practical men over details of mixing, handling, and hoisting. Those problems have been solved. In the concrete world I stand alone as the only product for whose rapid and economical con-

struction in place, in any size and height, full mechanical apparatus can be purchased on the open market at reasonable cost. The man who knows concrete, who loves concrete, and gives it its just deserts—perfect proportions, clean materials, thorough mixing, and proper reinforcement—can buy the equipment and be building me the next day after he gets it. I am reduced to a standard, and am sold by the foot; mystery and guesswork have been eliminated from me. The bridge-builder who never tackles two jobs that are identical in their requirements, should hail me as his long-lost-brother. The flatwork contractor who bothers with city councils and carries around sidewalk petitions, should look up from the ground to the heights where I stand with orders in my hand. I am not a fad or a passing fancy, but a fundamental. Build me according to the knowledge that will be given you, and the generation that comes after will look upon your handiwork and call it good. My wooden brethren but create future business for me; they are but fore-runners of the permanent type; a step only in the march of progress, while I am the journey's end, the goal where the profit in farming lies.

THE IDEAL BRICK MORTAR

The increasing demand for the use of hydrated lime in brick mortar does not cause a great deal of wonder when one studies its different advantages. Lime mortars, as is well known, are amply strong for the majority of brick work. The old method of slaking the lime on the job and allowing it to temper for a week or more, was an inconvenient method, and for this reason the more general use of straight cement mortars was advocated. The incoming of hydrated lime has, however, eliminated the inconvenience with the use of lime, and architects and engineers are gradually specifying larger amounts of hydrated lime to be used in all brick mortars. The reason for this is because hydrated lime is the most plastic material for mortars and results in a saving of labor and material, together with a more satisfactory job. Hydrated lime produces a fat, viscous mortar which may be worked and applied much easier than a straight cement mortar. The ease with which mortars containing hydrated lime work under the trowel enables the mechanics to lay a much greater number of bricks per day with the same physical effort as when using straight cement mortar. The plasticity which hydrated lime gives to the mortar makes it possible to form a perfect bed for the bricks. This has the effect of uniformly distributing the load as there are no high spots in the joints, which are so often found when tough working mortars are used. This plasticity also allows a freer sliding of the bricks in laying, which forces the mortar into joints and crevices where it is impossible to put the trowel.

Hydrated lime in Portland cement mortars is neutral to the cement and there is no reaction; no combination between cement and the lime, yet the use of a good percentage of hydrated lime is justified alone by the mechanical work it performs, distinct from any chemical or cementing value.

There is also an economic advantage connected with hydrated lime which is being appreciated by an increasing number in the construction field, and that is the greater sand carrying capacity which hydrated lime possesses. A straight hydrated lime mortar will carry five parts of sand, while the usual mixture for Portland cement mortars is three parts of sand. Assuming the initial cost of hydrated lime and Portland cement to be the same, the value of hydrated lime in the mixture will readily be appreciated when one considers that hydrated lime will carry 67 per cent more sand than Portland Cement, and consequently will

yield a volume of mortar 50 per cent greater than Portland cement. The same economic principle is involved in cases where hydrated lime is substituted for Portland cement, as the sand carrying capacity increases with the amount of hydrated lime substituted.

The disadvantages of using lump lime are overcome by the use of hydrated lime, as it is mixed and used immediately, and it is also possible to accurately proportion the amount of hydrate to be used, as this material is delivered on the job in bags containing a definite number of pounds. The convenience with which hydrated lime is prepared and mixed, its easy working properties, which insure better and more reliable joints, together with the economic advantage, is evidence that hydrated lime is fast regaining its position in the brick mortar field.

CONCRETE ROOFING FOR A STEEL FREIGHT CAR PLANT

The Pullman Company some time ago erected a new steel freight car shop, occupying a space of about 100 acres north of the main plant at Pullman, Ill., comprising the erecting building, 385 feet wide and 1176 feet long, the wheel and axle building, ninety feet wide and 360 feet long, the power house and machine shop, eighty feet wide, and 449 feet long, the fuel oil vault and other small structures.

Every part of this plant has been constructed in a thoroughly fireproof manner, from the concrete foundations to the concrete roofing tiles and gutters. The lighting is especially good. The skylights run the entire length of the building. They are of glazed steel sash, are hinged and arranged for operation from various points on the floor, giving good ventilation.

The concrete foundations were extensive for both the walls and columns and for the heavy machines used in fabricating steel.

The roof problem was, perhaps, the one requiring most study to obtain perfect water-tightness, elimination of fire danger, reasonably light weight and a proper balance between cost and permanency. The areas to be covered in this case were tremendous, the largest building having a floor area of over 452,000 square feet. It was necessary, too, to find a material which could be laid during the cold winter when the temperature was below zero for a large part of the time.

Cement tile was used in all of these structures with notable success. In spite of inclement weather an average of 10,000 square feet of roof was laid each day throughout the coldest season. At no time did the roofing force fail to keep pace with the structural workers on account of low temperatures.

* In addition to the roofing tile there were special shapes used for the gutters and for the lighting of certain parts of the buildings a special tile was used which had an insert of wire-ribbed glass, giving large lighting areas in the roof in addition to the skylights.

There are many roofing materials on the market today which offer comparative safety from fire and imperviousness to water and yet lack the stability and permanency of a roof made up of waterproof concrete units, with their long life and absolute fire-resisting qualities.

Ralph and Sumner Sollitt of Chicago were the contractors for this plant. It was built under the direction and according to the plans of C. Frank Jobson. The concrete roofing tile was furnished by the Federal Cement Tile Company of Chicago.

Universal Portland cement has been used throughout this construction, both by the general contractors for the building and by the Federal Cement Tile Company for the roofing tile.

The Highway Builder and the Motor-Driven Wagon

A Brief Review of Some of the Power Wagon's Advantages Which Have Appealed Strongly to Contrators and are Responsible for Marked Reductions in the cost of Building and Maintaining Our Common Roads.

There is a very definite relation between capital and industry. It is a relation that is quite generally understood because it is everywhere in evidence, and being so much in evidence, is necessarily widely recognized. There can be little industrial development without capital, and without business there would be little reason or need for capital.

A very similar relationship exists between the power wagon and good roads, although it is but vaguely understood or grudgingly admitted. Hard, smooth, permanent highways are an ultimate prerequisite for the final expression in motor haulage development if the maximum operating economy is to be realized from the machines. On the other hand, the increasing use of industrial motors is the greatest incentive toward wider road making activity. At the same time their use in actual highway work is encouraging more widespread construction by supplying a haulage medium far superior in efficiency and economy to anything heretofore known.

were worn more by rains than by traffic. Motor wagons have furnished the only logical justification for their existence.

Yet good roads mean much less to the future development of motor haulage. The power wagon possesses an immense potential work capacity of which no one has yet taken full advantage or even had a complete appreciation. Its development is more a matter of education than good roads, though as this education progresses the value and need of good roads will become greater and greater. As the motor truck operator learns more and more of the intensive application of his equipment his clamorings for road improvement will grow apace until good roads become as essential for him as machines are now for the road making industry.

Motor transport, as an institution, merits and demands the support of the road building business to a man. Every contractor, every material maker and dis-



Five-Ton B. A. Gramm Trucks with Load of 110 Cubic Feet of Stone.

Road Activity Due to Machines

It can hardly be doubted that there would be little road building activity were it not for the motor vehicle. Before the advent of the machine there was small real need for good roads, although the demand was artificially developed and the cost of the improvements was out of all proportion to the benefits received. The reason is found in the fact that the work capacity of the horse has been developed to the utmost and no further betterment is to be expected. The wonderful money-conserving qualities of good highways would waste themselves through lack of use because the horse will never be able to take full advantage of them. It is a case of animal endurance pitted against the permanency of cement and stone.

Through the application of machine power to common road haulage the money expended in developing the good qualities of better roads was given its first opportunity to show a dividend capacity. Until then good roads were more of a burden than a benefit. They

tributor, every builder of road making machinery is a beneficiary of motor haulage, and this whether he uses machines or not. In the development of motor haulage lies much of the present and all of the future of his business. As his realization of this fact grows from day to day he will contribute more freely, morally and financially, to the encouragement and increasing use of motor trucks, if for no other reason than that it is policy to do so.

Who supposes for an instant that the Lincoln Highway, for example, would have been built except for motor traffic—a road, by the way, which was conceived, built and paid for almost entirely by the motor vehicle industry? Again, who would believe that our tremendous good roads bond issues would succeed without the support of that huge motor owning group whose investment is counted in the hundreds of millions? And, who can conceive of our spending \$1,000,000,000 in ten years to increase the economy of the horse?

It was said at one time that good roads would develop the "back country" by providing a cheap means of communication with the large city markets. Millions of acres of rich soil lay fallow, it was claimed, because the cost of hauling crops to market made profitable farming wholly impossible. Good roads would relieve the difficulty, reduce the cost and open up the vast undeveloped resources of the country.

The statement of conditions was true enough, but the conclusion was erroneous. The remedy did not lie in good roads; a new haulage medium was needed. Nothing could be gained by providing potential benefits of which the horse could not take advantage. There was small purpose in building 50-mile roads when the horse could not regularly travel half that far.

With motor haulage, however, there is no danger that these benefits, either present or potential, will not be used. The risk is rather that they will be of the wrong kind, incorrectly designed because of a faulty understanding of requirements.

There is a wide difference between a good horse wagon road and a good motor wagon road—as much difference as between the two kinds of traffic. And although motor traffic is fast overtaking horse traffic we still build horse wagon roads. The ideal road for horse traffic is a hard surface and no grades. It is designed for light loads, low speed, narrow steel tires and to withstand the chopping of wrought-iron horse shoes. The ideal motor wagon road has a hard, smooth surface, a solid permanent base and grades are not a serious fault. It is designed for extremely heavy loads, high speeds, wide tires and rubber-covered wheels.

It matters little how "slow" a horse wagon road may be, since speed is not a vital factor. Interruptions give the horse welcome opportunity for rest. The motor wagon road, however, must be a "fast" road and must offer few or no interruptions to service.

The motor truck needs well-built roads because it moves large tonnages; it demands smooth roads because it runs swiftly; it claims durable roads because it pays dearly for bad ones; it deserves good roads because it typifies progress and economy.

Its requirements in this respect are receiving greater consideration now than in the past—from road builders and material men because in motor haulage they recognize the most potent factor affecting their future success; from highway officials because Industry is demanding that its economic needs shall be met; from power wagon owners and builders because operating economy is so closely related to road conditions.

In the actual work of road construction and maintenance the power wagon is daily demonstrating its capacity for performing useful service in an efficient and economical manner. Machines are in use pulling drags, plows, scarifiers and trains of trailers, in hauling all kinds of material and in dumping or spreading them as required. Some carry hot asphalt and slag, others force oil and prepared binders into the road surface under pressure, and many, with specially designed, wide, steel wheels, roll the roadbed as they pass over it on their hauling work.

The economy of the motor truck in road building service turns on its ability to perform a greater amount of work for every dollar expended than any other haulage medium. This superiority arises from its greater speed, greater carrying capacity and its ability to travel long distances without interruptions for rest or recuperation. The reserve power of its motor makes possible the use of special appliances, such as dump bodies, oil sprayers, etc., which must be power-driven if the best results are desired.

In road work the power wagon has been forced to demonstrate its superiority on the point of economy

alone. Advertising value, of so much significance in some lines, plays no part here. The business expansion brought about through the machine's increased radius of action is not, as a general thing, a highly important factor. A reduction in the cost of hauling, however, is vital and it is here that the motor truck shows such remarkable results.

Wisely selected and intelligently applied the power wagon has the ability to achieve enormous economies in road building. Where a team can haul a load of from one to two and a half yards depending on the condition of the roads, the motor truck can haul from four to six or more yards according to its size. While the team, with the loads named, may travel at from two to three miles an hour, the motor wagon can cover the same ground at a speed four or five times as great delivering three or four times as many loads in a day. And, although twenty miles would be considered a good day's work for such a horse outfit, the machine can travel 50, 100 or 150 miles if necessary. Indeed, its daily mileage capacity is limited only by its speed, the time required for loading and unloading, and the physical endurance of its drivers.

By reason of its advantages in these respects one power wagon in road work is usually able to displace from four to ten or more teams depending upon its carrying capacity, and the rapidity with which it is able to take on and discharge its load. Yet its cost, in some cases, may be no more than that of two or three teams used on similar work.

That the machine is able to show a marked economy over horses in all forms of road construction and maintenance is amply proved by the voluntary testimony of scores of well known users.

AUCTION OF CEMENT PLANT

The entire plant of the Great Northern Portland Cement Company, in liquidation, located at Marlborough, Michigan, will be sold at public auction, Wednesday, September 22, 1915, at 10:30 A. M., consisting of engines, crushers, grinding and pulverizing machinery, motors, kilns, dryers, cement bags, boilers, mills, in fact a complete plant. Inventory value over \$500,000. Stock on exhibition and can be inspected now. For descriptive circular address, Michael Tauber & Co., auctioneers, 317-319 S. Market St., Chicago.

TO BUILD COMPOSITE BRICK PLANT

An important extension of the brick manufacturing industry in New York was announced recently by the New York City Composite Brick Corporation, which will build a complete plant at Nos. 201, 203 and 205 East 129th street, at Third avenue and at Harlem river, for the manufacture of composite face brick.

The new plant when completed will have a capacity of 80,000 composite face brick daily—24,000,000 every 300 working days. The demand for composite brick in the New York market is estimated to be about 2,000,000,000 a year, with practically the entire supply coming into New York from outside sources. The fact that New York City has no local composite face brick plant is stated to be the primary reason for the construction of the new Harlem river plant of the New York City Composite Brick Corporation, which already has in operation at Winchester, Mass., a plant with a capacity of 60,000 brick daily.

The plans for the Harlem river plant have been approved by the Building Department, the machinery has been ordered and the construction of the building is to start soon. The American Clay Machinery Company has the contract to install the necessary manufacturing apparatus.

Perfecting Concrete Roads

The Part That Hydrated Lime Plays in Assuring Absolute Permanency to Concrete

By Charles Warner

With concrete rapidly reaching the position of providing the main ingredient for the best road construction, the problem of perfecting its use in detail is becoming more interesting and valuable. These steps in perfecting the detailed phases cover both economy of construction, as well as quality and absolute permanence. Some of the best engineers in the United States have, for several years past, been working over the problem of making concrete meet several desirable points. The ends and aims in this program of perfecting can best be analyzed by specifying the important quality features which should be developed to the maximum extent possible in order to assure to concrete as a road material the great goal of universal adoption. These are as follows:

First.—Homogeneity and plasticity with a minimum of segregation while mixing and placing.

Second.—Elimination of shrinkage during the preliminary hardening period.

Third.—Minimizing porosity and permeability to moisture after hardening.

Fourth.—Minimizing expansion and contraction due to moisture changes.

The intermittent stresses produced in the relatively thin slabs employed in concrete roads by the pressure of heavy wheels and by exposure to the weather make the full recognition of the above principles of the most vital importance.

Therefore, I will summarize the conclusions of many of the prominent engineers and societies* on the effect of hydrated lime in concrete mixtures as bearing on these principles. Hydrated lime is a soft, dry, and bulky material. Portland cement is comparatively coarse, sandy, heavy, and dense. When mixed with sand, stone, and water, there is a marked tendency to segregation of the cement. The wetter mixes of concrete used to facilitate its placing aggravate this condition. "Stone pockets" are commonly observed in inspection of concrete work. The reason is evident on watching the flow of concrete upon placing. The direct effect of hydrate additions is to make a fat unctuous concrete, which will flow better and segregate less in transmission.

Henry S. Spackman, of Philadelphia, said in a recent address before an engineering society: "Durability of concrete is dependent more on uniform distribution of the cement through the mass than on the actual quantity of cement in the concrete."

Mr. Edwards, of Edwards and Lazell, Portland Oregon, in a recent pamphlet said: "The properties of plasticity and homogeneity, which small percentages of hydrated lime give to concrete, cannot be secured in any other way at so little added expense for the material used."

For these reasons several of these engineers claim that hydrated lime is an insurance against poor workmanship and conveying methods, which cause segregation of the aggregates.

The question of shrinkage during preliminary setting has been tested extensively by the Spackman Laboratories of Philadelphia during the past two years. Mr. Spackman has proven that the ordinary concrete used under the usual road conditions shows

marked shrinkage the first twenty-four hours before hardening. He further reports that the best methods of protecting the top of the fresh concrete only partially offset seepage of the gauging water through the sub-base. This seepage naturally produces shrinkage and develops incipient fractures which later become cracks and lines of weakness.

In test slabs of concrete with hydrate additions made coincidentally, the result during this tender age was decidedly different. In *Concrete-Cement Age*, March, 1914, Mr. Spackman states that, "with the draining off of the excess gauging water, there is marked shrinkage in the twenty-four-hour period," and later adds: "The addition of hydrated lime . . . markedly reduces the shrinkage due to draining off of the surplus gauging water and also reduces the extent of the movement of the test pieces when alternately wet and dry . . ."

The direct effect of the permanent waterproofing of concrete slabs by the use of hydrated lime additions was discussed thoroughly in a series of pamphlets and articles issued by E. W. Lazell (Edwards & Lazell, Portland, Ore.) several years ago. Mr. Lazell first analyzes various waterproofing methods, and concludes that the introduction of some foreign material or materials into the mixture is the best principle to work upon. He then analyzes the characteristics of such a material, stating that:

"A material to fully meet the requirements should have a mineral base, and should be composed chiefly of lime so as to be similar to cement in its chemical composition. It would therefore seem that hydrated lime would be a material that would most nearly fill the requirements. Clay has been suggested as a suitable material, but its use in practice would be impractical, owing to the tendency of its particles to adhere, forming balls. These balls have little adhesion and hence would injure the strength of the concrete."

Quoting from a report of Committee D-8 on waterproofing materials of the American Society for Testing Materials, which report states:

"In general, more desirable results are obtainable from inert compounds acting mechanically, than from active compounds whose efficiency depends on change of form through chemical action after addition to concrete."

"Void-filling substances are more to be relied upon than those whose value depends on repellant action. Assuming average quality in sizing of the aggregates and reasonably good workmanship in the mixing and placing of the concretes, the addition of ten to twenty per cent of very finely divided void-filling mineral substances may be expected to result in the production of concrete which under ordinary conditions of exposure will be found impermeable, provided the work joints are properly bonded, and cracks do not develop on drying, or through change in volume due to atmospheric changes, or by settlement."

On the point of endeavoring to secure this result by richer cement mixtures in the concrete, this same report says:

"It has been suggested that impermeable concretes could be assured by using mixtures considerably richer in cement. While such practice would probably result in an immediate impermeable concrete, it

*H. Purvis Taylor, Richard K. Meade, Sanford E. Thompson, E. W. Lazell, Ira H. Woolson, Henry S. Spackman, American Society for Testing Materials, Government Bureau of Standards.

is believed by many that the advantage is only temporary, as the richer concretes are more subject to check cracking, and are less constant in volume under changes of conditions of temperature, moisture, etc. Therefore, the use of more cement in mass concrete would cause increased cracking, unless some means of controlling the expansion and contraction be discovered."

The Bureau of Standards at Washington, D. C., in its exhaustive report on waterproofing cement mortars states:

"This is the most efficient medium, and results in an almost impermeable mortar at the two weeks' test. Its value is probably due to its void filling properties, and the same results could be expected from any other finely ground inert material, such as sand, clay, etc."

The word "this" refers to hydrated lime used in these tests.

While from the standpoint of producing a waterproof concrete, the various substances mentioned other than hydrated lime might prove equally effective, their use as a substitute for hydrated lime would not give the same plasticity to the mortars or concretes. It would seem dangerous, in view of the well known bad effect on the strength of concrete, of silt, fine sand and clay matter in the sand, to add such material to concrete roads, whereas in adding hydrated lime, a material is used that is mildly cementitious in itself, has a different physical action and no risk should be assumed.

Mr. Spackman in a recent address before an engineering society in Baltimore stated:

"The greater plasticity and readiness to flow into place observed in the use of hydrated lime in concretes is probably a void-preventive, and therefore aids in completing the void-filling action noticeable by the use of small proportions of hydrated lime."

Both H. Purvis Taylor and Sanford E. Thompson during the past eight years have exhaustively tested this vital principle of waterproofing concrete so particularly essential in road construction. In their reports made at different times to the American Society for Testing Materials, they show most conclusively the large improvement coming from small additions of hydrated lime in producing practically waterproof results.

One run of tests by Mr. Thompson illustrates: A 1:3:5 concrete under water pressure of sixty pounds to the square inch had its flow per hour reduced from 70.6 down to 0.7 grams by the addition of twenty per cent of hydrated lime. In this important series of tests, Mr. Thompson brings out the point also observed by Mr. Spackman and other engineers, that:

"The cost of large waterproof concrete structures frequently may be reduced by employing leaner proportions of concrete with hydrated lime mixtures, and small structures, such as tanks, may be made more watertight."

This observation leads to the special problem of leanness in concrete mixtures and its resultant economy. As referred to above in the report of Committee D-8 of the American Society for Testing Materials, and as is generally known, the richer a cement mixture, the greater expansion and contraction under moisture changes. Mr. Spackman illustrates this by observing that neat cement moves approximately four times that of a 1:3:5 concrete, and that a 1:2 cement mortar will move approximately fifty per cent more than a 1:3 cement mortar under the same moisture changes.

A neat cement mixture would move upwards of four inches in one hundred feet between extreme dry and wet conditions. The effect of movement of this

kind in road slabs is evident, and the importance of reducing such movement to the absolute minimum for the purpose of permanency goes without saying. Therefore, the use of the leanest concrete mixtures consistent with the desired strength, becomes good practice, both for economy and permanency of construction.

In addition to the direct economy arising out of the intelligent use of leaner mixtures, the reduction in expansion and contraction also leads to reducing the number or to the entire elimination of expansion joints, in concrete roads. This practice is steadily developing and further engineering study with attending practical experiments, are leading the way to the continuous concrete road with very infrequent cracks and *no expansion joints* whatever.

The Engineering Department of the Maryland State Highway Commission has apparently proceeded far on these lines in expressing the general views that concrete roads should be made as impervious as possible, thereby reducing the movement of the road from moisture changes, and that expansion joints are best eliminated, allowing the road to slightly open in irregular lines at points where it will naturally give and take. From the general study and use of hydrated lime in concrete, it is evident why hydrated lime "fills the void" in more ways than one, for this important use of concrete.

This leads to the question of toughness and strength, as effected by hydrate additions. The extended tests made by many of these engineers justify the following general conclusions:

First.—By substituting ten per cent of hydrated lime for ten per cent of cement, slightly lesser strengths are noted, but the variations are immaterial as compared with variations due to other factors in concrete work.

Second, by the addition of ten per cent hydrated lime to the cement ingredient, slightly greater strengths are secured. (These substitutions and additions are by weight.)

Mr. Spackman made further tests on toughness or, more properly, wearing characteristics, by tumbler. The concrete, with hydrated lime addition, lost 0.6 per cent by weight, as against a loss of 1.5 per cent by the corresponding sample of straight concrete under similar conditions. Mr. Spackman attributes the improvement to the greater homogeneity and uniformity naturally resulting in the sample using the hydrated addition.

In conclusion, the following summary of views is presented so that it may be clearly understood in part why this article so strongly recommends the more general adoption of the use of hydrated lime in concrete roads.

First.—Hydrated lime is now manufactured by many plants under the same strict chemical control as used in the best cement mills and so far as care in its manufacture is concerned, is as safe a material to use as Portland cement.

Second.—The American Society for Testing Materials has recognized the position of this material, and is standardizing it. Tentative specifications have already been adopted as a guide for the use of engineers to assure a sound and reliable hydrated lime.

Third.—Hydrated lime and Portland cement are neutral and there are no unknown or uncertain chemical actions to set up. Therefore, there need be no fear or concern of any uncertain chemical or physical action in the use of hydrated lime in any concrete or cement mortar work.

Fourth.—Short stretches of concrete, say one hundred feet or thereabouts, will not demonstrate the average improved results in the use of hydrated lime.

If it is agreed that the principles set forth in this article are sound, then relatively large sections of permanent roads under construction, say two or three miles, should be subjected to hydrated lime addition, and the average result of these hydrated sections should be compared with the result of several miles of straight concrete sections constructed under the same general average conditions.

For these various reasons, it is most important to study the practical development of hydrated lime in concrete for all road work. If the conclusions drawn from extensive work and study of the prominent engineers referred to mean anything, they mean that much better concrete results from the judicious use of hydrated lime.

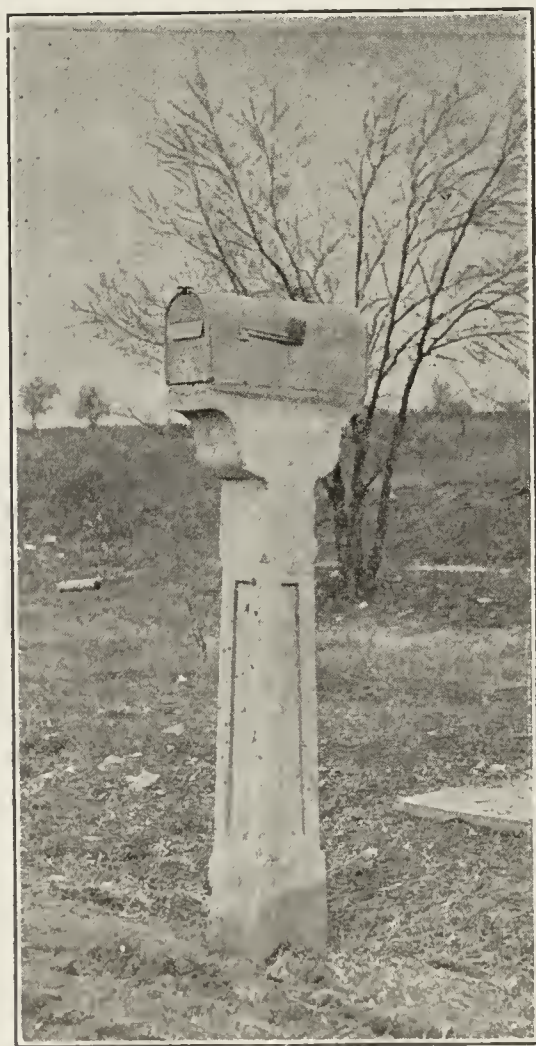
With these deficiencies covered in a practical manner, we have in concrete a road material of greatest permanency.

Editor's Note.—This article was prepared especially for Better Roads and Streets, by Mr. Warner, head of the company which bears his name, and who is one of the leading American authorities on the manufacture and use of hydrated lime.

CONCRETE POSTS FOR MAIL BOXES

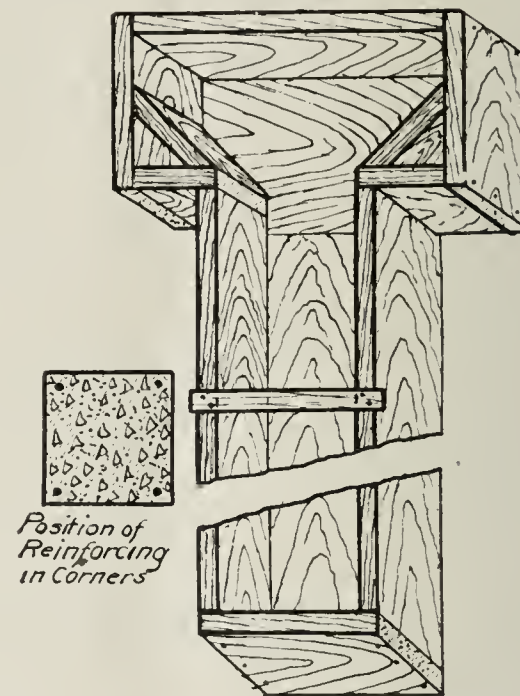
The accompanying picture illustrates a novel but thoroughly practical use of concrete. It is a post supporting a mail box on a rural free delivery route near Dallas, Texas. The concrete features consist of the post or support for the box. Wooden posts are always subject to rapid decay at the ground level, where alternate wetting and drying takes place, and to avoid the necessity of renewals and repairs the concrete post was made. It is quite ornamental in design, and at once conveys the impression that the owner takes pride in the appearance of his premises.

A more simple post, one easier to make, would effect the same economy. The form for casting a post of this kind is shown below. The post should be about 7 feet long. Planted at a depth of 3 feet, this would leave the box at convenient height for the delivery or extraction of mail. The form, as shown



Concrete Mail Box Near Dallas, Texas.

on the drawing, is simply a three-sided box providing for a post 6 inches square. The form is placed on the ground in horizontal position, with open side up, and filled with well-tamped concrete to a depth of about 1 inch. Then $\frac{3}{8}$ -inch reinforcing rods are placed at either side, leaving about 1 inch space between each rod and the side of the form. The box is then filled to within 1 inch from the top and two more reinforcing rods are placed on the concrete. The form is then filled to the top and the concrete struck



Form for Casting a Concrete Post Similar to That Near Dallas.

off. The rods may go straight from the bottom to the top of the post, as it will not be necessary to curve them outward at the bracket.

The form or mold may be made with one or more braces nailed across the upper or open side to prevent the sides from spreading when the concrete is tamped. The bracket effect at the top is obtained by inserting extra pieces of wood at the corners, as shown. If preferable a post in the shape of a letter T may be made, eliminating the bracket feature. A perfectly plain post without projecting top would also answer the purpose.

To provide for fastening the mail box to the post, bore two or perhaps four holes through the board at the top of the form. Insert in these holes the bolts with the heads down, or inside the form. The bolts will be imbedded in the concrete when it is placed and when the form is removed the threaded ends of the bolts will project slightly above the top of the post. Holes cut in corresponding position in the bottom of the box will permit the bolts to pass through and the box will be secure when nuts are placed on the bolts.

Mix the concrete in the proportion of 1 part Portland cement, 2 parts sharp, clean sand and 4 parts crushed stone, ranging from $\frac{1}{2}$ inch to 1 inch in size. Allow the concrete to remain in the forms for at least 24 hours. When the post is removed protect it from freezing, or if made in summer, from hot winds and sun. Wet it thoroughly for a week or ten days after removing it from the forms.

Concrete posts do not warp, decay or burn. When used for fencing they keep in better alignment than wooden posts. Concrete is now used for fence posts, clothes poles, hitching posts and gate posts. Concrete fence posts have been made at an average cost of less than 25 cents each, notwithstanding the fact that all material was purchased, and even in well-timbered districts they are being substituted for wooden posts on account of their low first cost and everlasting qualities.

MORE HONORS FOR IMPERVITE

Official Tests Explain Its Success in Practical Waterproofing

At the Panama-Pacific Exposition now being held in San Francisco, the Committee of Awards has just handed down its decisions for the many and varied products exhibited.

In certain instances, thousands of dollars have been invested in displays, but although a charming arrangement may attract the casual passer-by, the Judges must consider merit only. For cement waterproofing compounds a careful series of tests were made, each one duplicating the other as regards proportions used and method of handling. As a result of these tests, Impervite proved so far superior that it was given the gold medal (highest award), without the chance of a quibble or doubt.

In 1909 the invention of Impervite (manufactured by the Standard Paint Company, New York, N. Y.) was the climax of a brilliant research. All types of raw and finished materials were studied and a very broad patent has since been allowed. Indeed the twenty-three claims cover such a wide scope that five years elapsed from the application for the patent to its final granting.

Up to the discovery of Impervite, practically all waterproofing compounds were based on the old Sylvester process of soap and alum. Our grandfathers used to take alum solution and soap suds and apply these alternately to a brick or masonry wall, where they reacted to form Aluminum Stearate (alum soap).

Years later Aluminum Stearate was supplied ready-made, and then Calcium Stearate (lime soap) became popular because cheaper.

Getting away entirely from the soap idea, Impervite was perfected. Impervite is an "Asphaltic Emulsion," free from stearates and other soaps.

It should be explained that, although soaps have a certain amount of waterproofing effect, they tend to reduce the strength so that not more than two pounds can be used to the bag of cement. This is enough to assist the workman, but it is insufficient to give a "factor of safety." Impervite does not injure mortar, therefore larger quantities can be used, which will make waterproofing sure, even under unfavorable conditions.

It is possible to take a sample of cement mortar without any Compound and by excessive work make it nearly as waterproof as a sample containing Compound. If, however, the same amount of workmanship is done in both cases, the advantages of the Compound are apparent. Nowadays, when labor is expensive, anything which will give satisfactory and positive results, with less expenditure of time, is of economic importance.

Mr. Logan Waller Page, of the U. S. Department of Agriculture, found that in a five-hour test, plain mortar leaked 17 cubic centimeters, whereas similar specimens of Impervite mortar were absolutely tight.

The U. S. Bureau of Standards describe tests of Impervite in Technologic Paper 18. Impervite was designated as Compound No. 11, and according to the statement on page 101, was the only one giving results which warranted further investigation.

In tests recently made by two European laboratories Impervite proved three to five times more efficient than the same weight of Soap Compound.

When it is considered that Impervite, being an asphaltic emulsion, can be sold at the same or a lower price than the older class of waterproofings, its value is evident.

A $\frac{3}{4}$ -inch facing of cement mortar containing Impervite will waterproof any leaky masonry. It may be applied inside, even where the pressure comes from the outside.

It is a mistake for waterproofing manufacturers to claim that cement needs waterproofing in every case. There are many uses of cement where no addition of compound is required. On the other hand, if a waterproofing is needed, it is cheaper to use Impervite than to attempt to get the results with expensive workmanship.

POLK SYSTEM OF MONOLITHIC CONSTRUCTION

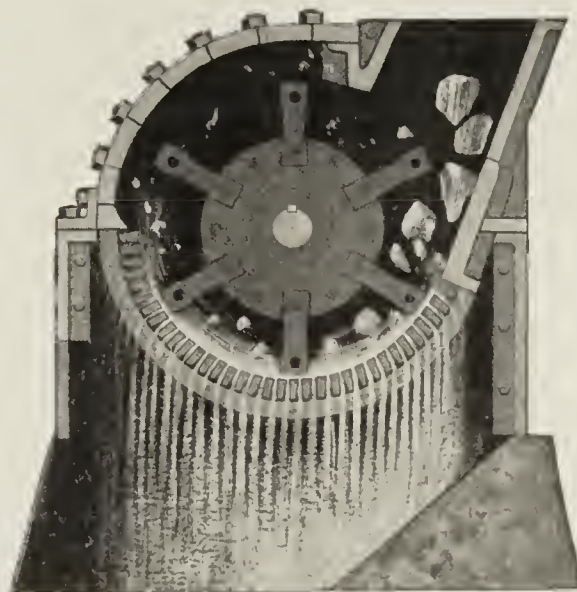
The firm of Polk, Genung, Polk Co., Fort Branch, Ind., are exploiting the Polk System of circular steel forms for monolithic concrete construction. After eight very successful years, this system, bearing an originality all its own, is attracting no little attention. The system has been applied to water towers, silos, and grain storage construction, and the machines for these purposes have been on the market eight years. The machines are made in different diameters, one outfit accommodating itself to any height.

Owing to the low construction cost which this system guarantees, it has naturally met with unusual success.

One specially important and unique feature of these machines is that all forms are carried independent of the concrete walls, and raised by a system of special jacks independently of everything except the center mast. Scaffolding is eliminated, except the platform carried by the machine, and this is constantly maintained at the same relative position to the work.

JEFFREY PULVERIZERS

The Jeffrey Manufacturing Company, 914 North Fourth, Columbus, Ohio, have recently issued a new 48-page Bulletin, No. 147-14, illustrating and describing the prominent features of their complete line of



Interior view of Jeffrey Type A Pulverizer. A general purpose machine for reducing dry rock products to a moderate degree of fineness.

Swing Hammer Pulverizers, giving full information regarding capacities, speeds, horsepower, general dimensions, etc. More than 1,000 of these machines are now in daily operation reducing Limestone, Shale, Gypsum, Clay, Coal, Coke, Ores, Tankage, Bark, Oyster Shells, Rock for Road Top Dressing, and many other materials. A free copy of this bulletin may be obtained by writing to their home office.

Among The Cement Mills

TWENTY-SIX TONS OF DYNAMITE EXPLODED IN ONE BLAST

People from Chattanooga, South Pittsburg, Jasper and other places who went to Richard City, Tenn., felt more than repaid for their trouble when they had the very unusual opportunity of seeing twenty-six tons, or about \$9,000 worth of dynamite, exploded in one "shot." After many weeks of preparation, the



View of the Blast in Quarry of Dixie Portland Cement Co.

Expert handlers of high explosives tamped fifty-four 6-inch holes with twenty-six tons of 60 per cent dynamite. The holes vary in depth from 92 to 105 feet all through solid rock. Each charge of nearly half a ton was exploded with a Cardeau-Bickford safety fuse.

throwing of an electric switch brought on the spectacular climax of the long siege of hole-drilling, placing of the explosive, running of electric wires, etc. The large number of expectant spectators, already keyed up to the highest pitch, were warned to be on the watch by the shrill tones of the Dixie Portland Cement Company's big whistle about 12 o'clock, and every eye was directed toward the cliff which was to be torn asunder by the powerful explosive.

First visible indication to the watchers that the current had been applied was a quiet sinking of the cliff along its entire length—because the wiring was designed to affect the explosive at the lower extremity of the drilled holes. Then a great shower of stones rose into the air, hundreds of feet it seemed, and certainly to such a height that no one could well help wondering where they would fall. Another moment and the air above the quarry was filled with limestone dust, which might have been taken to be smoke except that, an instant after, when the smoke really did appear, it was of different color and much greater intensity. The visual phase of the exhibition was accompanied by much less noise than a layman probably would expect from such a volume of explosive. What noise there was came as a rumbling roar, and was not as significant of the cause as the vibration of the ground and buildings, and rattling of windows.

There was no untoward incident. Those who hurried to the quarry immediately were sorry that a ruling of the authorities, though probably seconded by their own temerity, prevented them seeing the spectacle from a nearer vantage point. On the quarry edge opposite the dismembered cliff there were no newly fallen rocks or other evidences of the terrific explosion. Except for "safety first" all might as well

have been within a few score yards, like the movie operators and few others whose position with the company or business connection gave them the "privilege."

Except these few, the scores of spectators saw the blast from hotel roof porches and windows, or from other positions around the big plant, beyond the possible danger zone.

Quarry Superintendent Spearman received many congratulations on the success of the big shot. He, President Richard Hardy and others connected with the works felt well satisfied with the result of the labor and investment. The well-placed dynamite loosened enough limestone to keep the monster crushers and kilns busy for eight months or more, it was said.

Several boulders hurled from the solid cliff into the quarry pit seemed as large as average rooms in a dwelling, but, judging from the visible mass of stone, by far the greater part was reduced to more workable size. Without delay, after what to the laity seemed a tremendous undertaking worthy of a celebration, a force was put to work laying track so the stone may be conveyed to the "Big Bertha" crusher—first of the series through which the material passes before being reduced to flour-like fineness.

On the new face of the cliff were seen great vertical scars, only remaining trace of the holes drilled at such outlay of time and expense in weeks gone by. Chunks of stone in this freshly exposed surface lost their equilibrium and tottered into the pit. Someone remarked, "A good rain is needed now to bring down whatever is loose and nearly ready to fall."

Back to the hotel and very soon all visitors sat down to a typical Dixie-Portland a la Hardy dinner as guests of the company. Soon after dinner most of the Chat-



After the Shot Was Fired.

Two carloads of Atlas powder were exploded in one blast in quarry of Dixie Portland Cement Company at Richard City, Tenn. It required six months of night and day preparation by a large crew of laborers using Keystone well drills.

tanooga started back, possibly with visions of Andrews field. Then the rain came—whether result of the big atmospheric-disturbing explosion or because it was needed to finish the fall of loosened stone on the cliff face. Those who favor the first theory (in line with western practice) can lean on the fact that it did not rain one 'steenth as much in Chattanooga as in the region of Richard City.

Capt. Calvert of the Essanay Company, who with operators stayed close to the firing line for professional reasons, says they got some "great stuff." Other well-known companies who filmed the event were the Pathe and the Mutual. Be it said, the cameras peered out from temporary shelters which with three-inch planking bespoke safety first. The great cement plant was practically shut down during the explosion and all hands ordered out of doors. This was not entirely for their edification, as other "shots" have played minor havoc in the buildings. On one occasion a cave-in of high piled cement in the warehouse was caused, several machines being buried.—Chattanooga Times.

REINFORCED CONCRETE SCREW-CONVEYOR AND ELEVATOR CONSTRUCTION

By D. C. Findlay*

In the construction of a new raw grinding cement mill for the Vancouver Portland Cement Co., Limited, of Victoria, B. C., concrete was used for the rather unusual purpose of building all the 16-inch screw-conveyor casings and also for the elevator legs.

Concrete Elevator Legs

Referring to Fig. 1, the details of construction are shown. Steel forms were built, designed to be easily

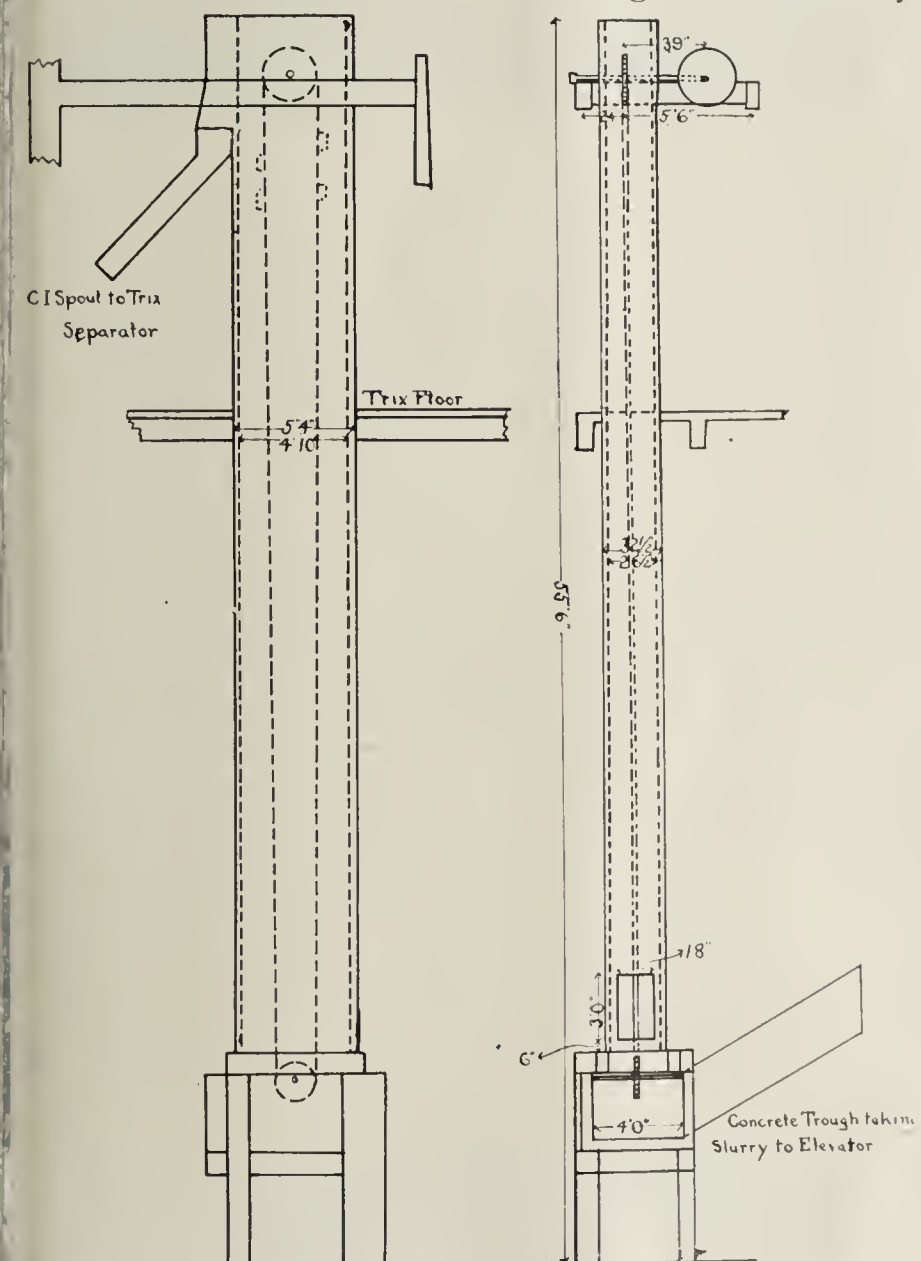


Fig. 1. Concrete Elevator Leg.

collapsed, and were used for the inside and outside forms. The walls of the elevator were carried up 3 inch thick the entire height of 47 feet 6 inches from the mill floor, and were reinforced by $\frac{1}{2}$ -inch round reinforcing bars running continuously through the entire height, and being held in position by a 1x1/16-inch hoop steel spaced at 12-inch centers and securely wired to the vertical bars at every intersection. Two

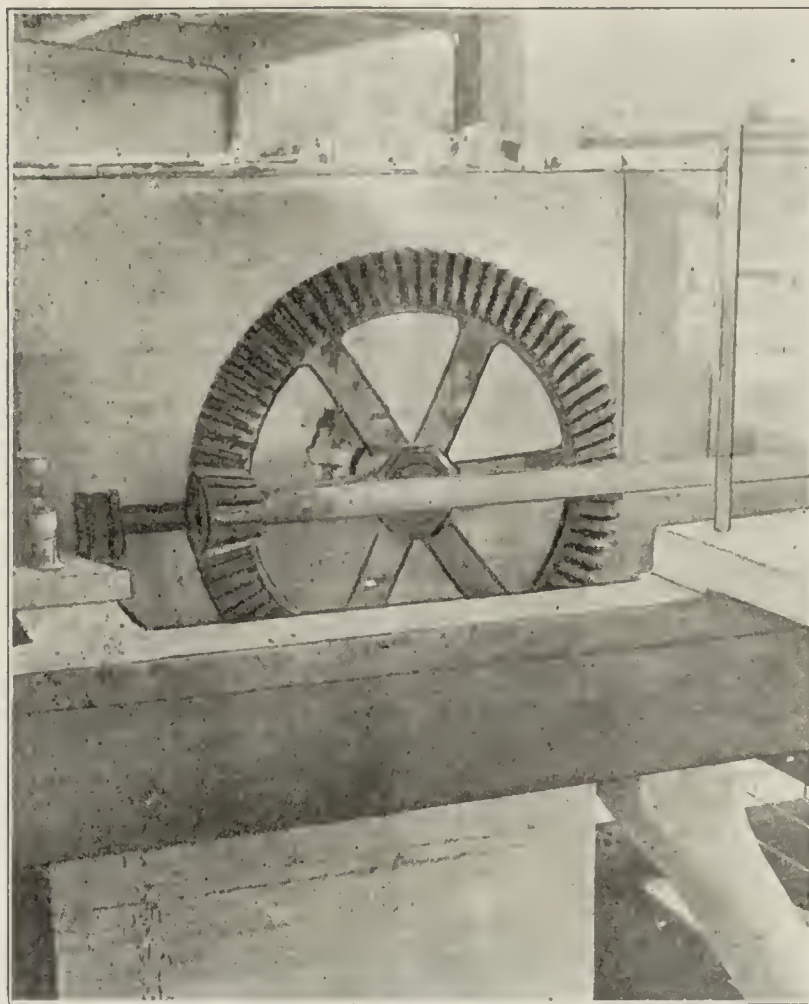


Fig. 2. Head of Elevator.

steel forms were used, and after pouring the first section the second form was bolted to the angle iron flanges, and poured, before stripping the former. This insured a smooth joint between each pouring of a 6-foot section.

These elevators raise the wet slurry as discharged from the Kominuter mills (manufactured by F. L. Smidth & Co., New York City), and discharge it through cast iron spouts 10-inch diameter and flared

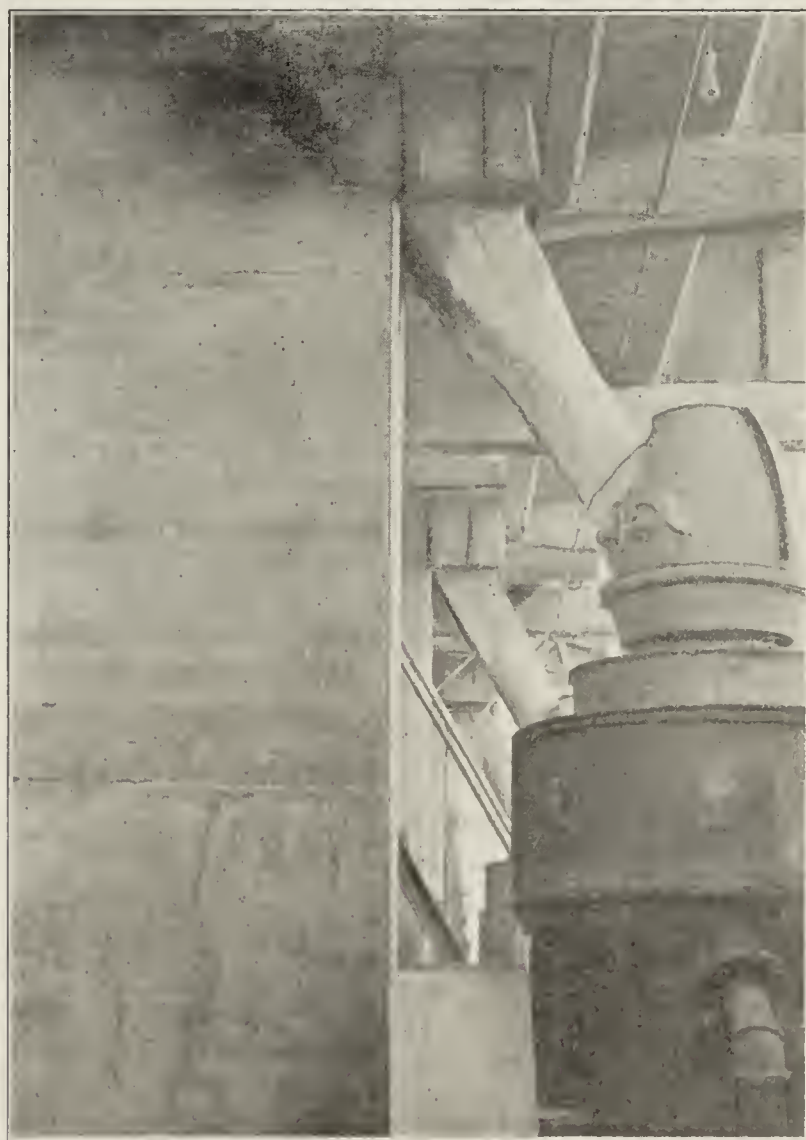


Fig. 3. Heads of Elevators.

*Mount Tolmie road, Victoria, B. C.

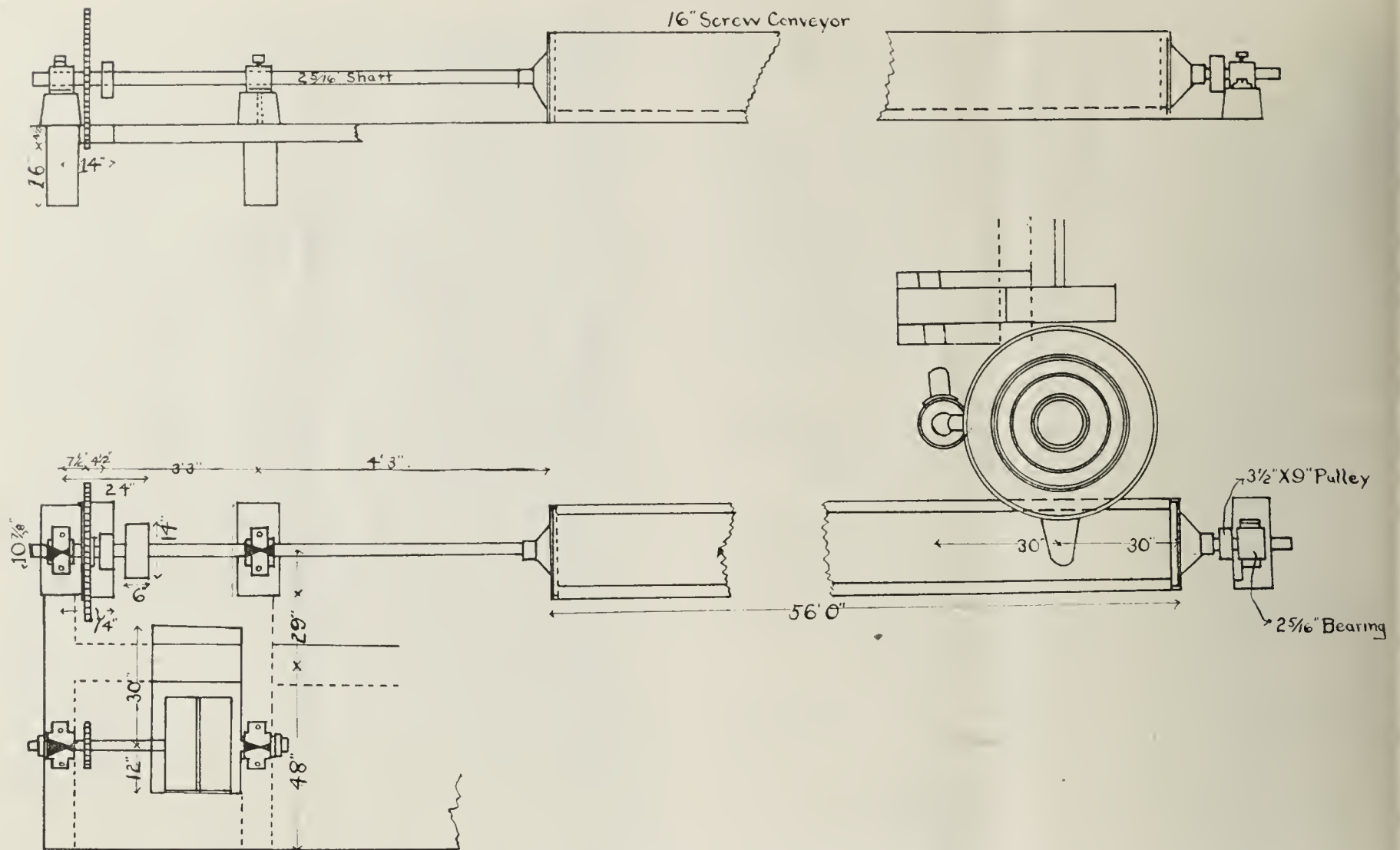


Fig. 5. Details of Conveyor Resting on Floor.

to fit the rectangular discharge opening into the Trix separators on the separator floor.

The plan view shows the method of leading the wet slurry, containing about 33 per cent of water, into the boot of the elevator. The slurry is discharged into a concrete box on an incline and carried by beams and columns. These beams and columns serve also to support the dead weight of the elevator casing, which

weighed about 25,000 lbs., as well as the slurry, which is continually running down to the buckets, which are 7x7 1/4x16-in., carried by No. 844 elevator chain.

An opening was left in the bottom with a steel door for examination and fastening on buckets, and the top has a steel cover bolted to the concrete with hinged doors, which completely uncovers the traction wheel, enabling work to be done on the elevator buckets.

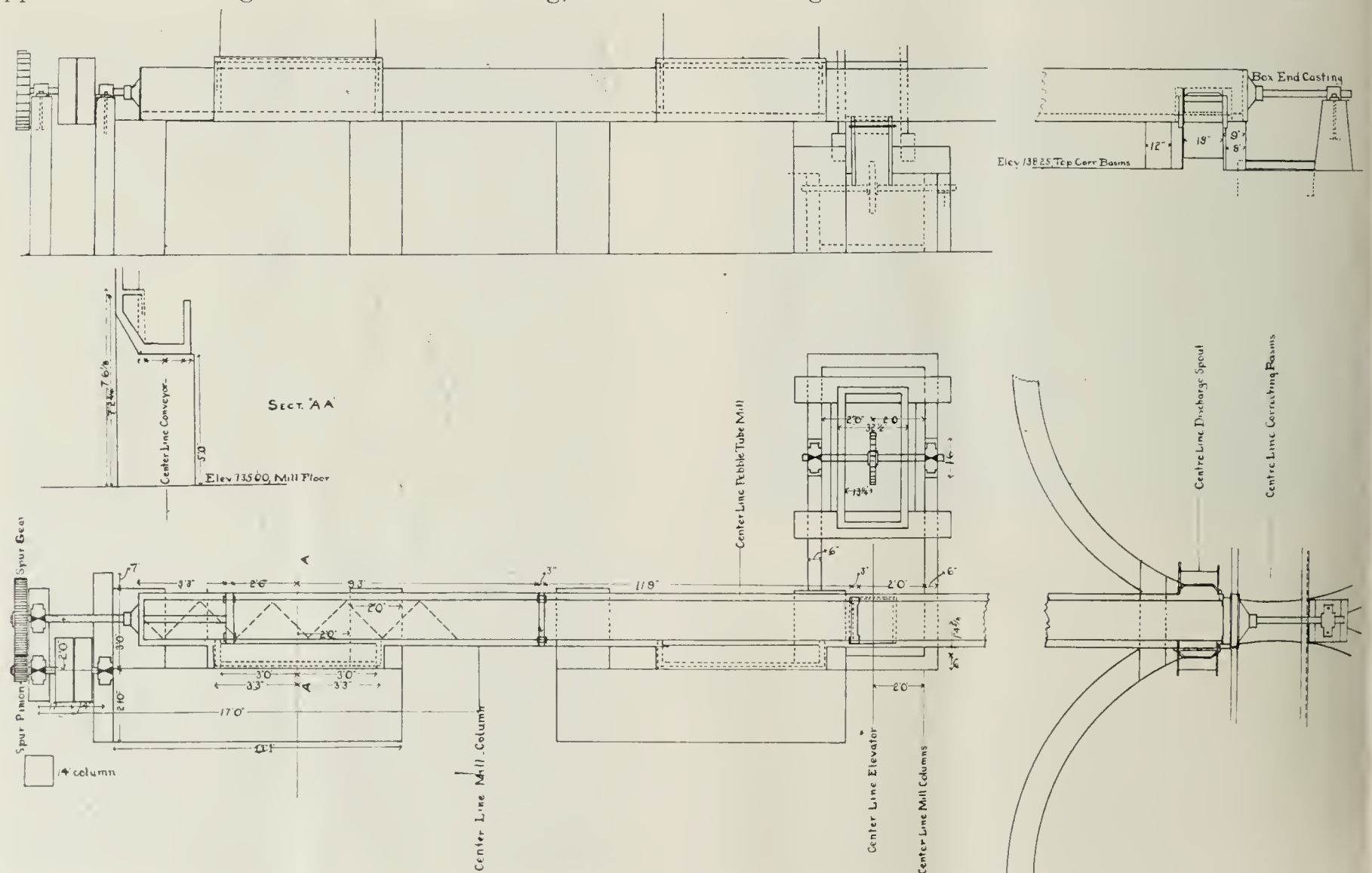


Fig. 6. Details of Conveyor Resting on Piers.



Fig. 4. Elevator Leg in Position.

The entire weight of the loaded buckets, chain, etc., is carried by two 8x14-inch concrete beams running each side of the elevator leg, and having bolts set in the concrete to attach the bearings. The elevator is driven through a bevel gear directly off the mill pinion shaft.

Fig. 2 shows the head of an elevator with its bevel gear and the cast iron spout to the Trix separator; made by F. L. Smidth & Co., New York City. Fig. 3 shows the concrete construction around the heads of the elevators and a part of three of the elevator legs in operation. Fig. 4 is a view taken during construction of the mill, showing the elevator leg in position.

Four elevators have been built and in operation since August, 1913, with very satisfactory results, and at the cost per elevator of approximately \$200 exclusive of chain, buckets, etc., which was about half of the best quotation for a steel elevator leg.

Concrete Screw-Conveyors

In order that all details in the new mill should be of concrete, the 16-inch screw conveyors handling the



Fig. 8. Screw and Hangers in Position.

wet slurry from the separators to the tube-mills, and from the tube-mills to the correcting basins, were designed in concrete.

Fig. 5 and 6 show the plan and details of these. The side walls and bottom were made 3-inch thick and reinforced with $\frac{1}{2}$ -inch round bar securely tied to $\frac{3}{8}$ -inch stirrups. In Fig. 5 the conveyor rested directly on the floor slab, but in Fig. 6 it is supported by concrete piers about 5 feet from the floor. Bolts were carefully set in the shell to attach the conveyor hangers, and ordinary cast iron conveyor box ends were bolted to the ends of the conveyor, through which the $2\frac{15}{16}$ -inch shaft was carried to outboard bearings.

Special construction to connect to the splash casings of the tube-mills was required at each mill. In Fig. 6 and at the end, a double discharge casting, with slides on each side, was built into the concrete, enabling the slurry to be deflected into either slurry basin. In the center, a cast iron spout was built into the bottom of the conveyor, which enabled the slurry to be sent up the concrete elevator and through the clypeb mill, or sent directly to the slurry basins, as desired.

These conveyors handle slurry containing about 33 per cent of water and are waterproof, and very satis-

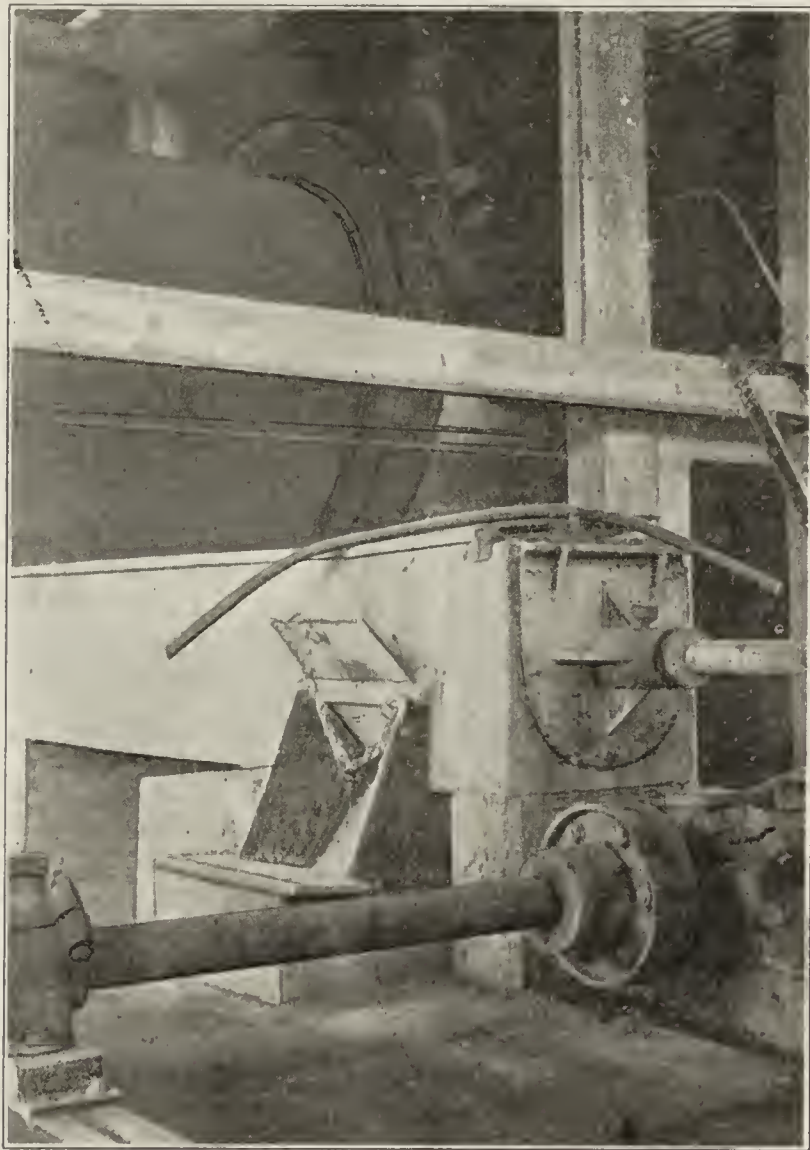


Fig. 7. Discharge End of Screw Conveyor.

factory in operation and appearance. For both the elevators and conveyors, a wet mixture of concrete mixed in proportion of 1 cement, 2 sand, and 3 of pea gravel was used, without any waterproofing material.

Fig. 7 shows the discharge end of a concrete screw conveyor. Fig. 8 shows the 16-inch screw and hangers in position before the cover was in place.

The writer designed and supervised the construction of both the elevators and conveyors for the Vancouver Portland Cement Company, Ltd., of Victoria, British Columbia.

FOREIGN CEMENT NEWS

On one day—June 10, 1915—the report of the collector of customs at New York showed shipments to the various Latin-American countries amounting to nearly \$3,000,000. One item to Buenos Aires, Argentina, was \$13,000 worth of cement in one order.

In 1914, the United States exported to all countries cement to the value of \$3,382,282.

Japanese newspapers report that the situation among Japanese cement factories is such that the smaller factories have been closed, and some of the larger ones are in serious straits. Some of the latter, however, have entered the South Seas trade, and are shipping considerable cement to various islands in that part of the world and to Australia.

In 1914, Japan exported to the Philippine Islands cement to the value of \$113,680, as against \$59,047 in 1913.

Shipments of cement to the Philippines from Hongkong, China, in 1914, amounted to \$111,476, as compared with \$160,289 in 1913, \$239,194 in 1912, and \$349,616 in 1911.

The Katni Cement & Industrial Co., of Katni, India, has just completed its works—the only cement factory in central India—which are expected to turn out from 30,000 to 40,000 tons yearly. The cement will be sold in bags, it is said, at considerably lower prices than is asked for imported Portland cement. It is to be manufactured by the wet process, in rotary kilns driven by electric power.

The prospects are that Cuba will require large quantities of American Cement during this year and 1916. This market is a particularly desirable one for many reasons, chief of which is that it is not necessary to grant long terms of credit such as are insisted upon in many countries of Latin-America.

There is an increasing market for American cement in France; and with the conclusion of hostilities in the present war, the demand promises to be immense. This will be due to the fact that a great many structures which have been destroyed will be rebuilt of cement and reinforced concrete. Until the outbreak of the war, Germany and Austria supplied by far the greater part of the Portland cement used in France.

At St. John's, Newfoundland, a company has just been organized to manufacture cement and wood pulp. It is capitalized at \$21,000,000.

KNICKERBOCKER PORTLAND CEMENT COMPANY POWER PLANT DESTROYED

On August 2nd, as you have doubtless been informed through the press, the land on which our power plant was located, as well as several acres adjoining, sunk approximately twenty feet, completely wrecking the power plant—an occurrence beyond human conception. The remainder of our plant was uninjured by this catastrophe, and lack of power alone prevents the immediate resumption of full operation. Work for the restoration of power is being carried on with all possible speed, writes the Knickerbocker Portland Cement Company, of New York, to their customers with whom they have unfilled contracts.

Notwithstanding our misfortune and the fact that the disaster which has occurred legally excuses us from the obligation to carry out our contracts, we have your cement interests in mind at all times, and consequently, have arranged with the Alpha Portland Cement Company to supply us with a quantity of Alpha Portland cement which, we estimate, together with the Knickerbocker we have on hand, will enable us to continue shipments on contracts without interruption. We should have authority to fill your shipping orders with either brand or both, and we request

you to co-operate with us and signify your consent to this arrangement, and at the same time to furnish us an estimate of the quantity you will require this year on any contract or contracts you have signed with us, as well as the probable dates of delivery, as near as you can reasonably determine.

THE CHEMIST IN CEMENT WORK

Portland cement was manufactured in the United States in a small way 40 years ago, said G. S. Brown, president Alpha and Catskill Portland Cement Companies, in an address before the convention of the American Chemical Society, New Orleans. It occupied, however, a very minor position among the industries of this nation until the beginning of the present century. At this time the production of Portland cement is not far from 125,000,000 barrels, or 20,000,000 tons per annum, and is, perhaps, next to the manufacture of iron and steel, the manufacturing industry which gives to the railroads their largest tonnage. It is safe to say that the tremendous advance made in this industry has been, for the most part, due to the zeal and knowledge of the chemist.

In the realm of the use of Portland cement the chemist has also done much. He has been particularly active in educating those who use cement to the necessity of seeing that the aggregates used with the cement are of proper quality. He has also given a great deal of time to the development of specifications which will protect the user of cement. Originally each engineer had his own specifications, and many of them were most peculiarly and wonderfully drawn. The energetic efforts of the chemist practically eliminated all of these freaks, and we have today, through his efforts, standard specifications which insure to any user of cement an absolutely sound article.

CEMENT DUST

Interests of citrus growers were made paramount yesterday by Superior Judge Densmore of Riverside, California, when he handed down a decision in the long drawn out court battle between orange and lemon producers of the county and the Riverside Portland Cement Company, ordering the defendant company to operate its plant in such a manner that not the slightest quantity of cement dust be discharged upon the trees surrounding the plant.

The case—that of Robert N. Bridson against the cement company—was the one chosen as a test case out of the many filed against the cement company.

Bridson, who filed his suit November 9, 1914, asked for \$4,975 damages and a permanent injunction against the operation of the plant in an injurious manner. There are forty similar cases pending in the Riverside courts.

Many other orchardists who claimed damages from the cement dust which spread over a large area surrounding the plant have had their claims settled by arbitration. The court awarded Bridson \$1,000.

The cement plant has been in operation continuously since 1907.

In January, 1913, an electrical dust catching device was installed at a cost of \$100,000, notwithstanding which many claims for damages have been filed.

Attorneys for the company who have not announced an intention to appeal from the decision as yet, said yesterday they hoped to install improved dust collectors which would impound all harmful dust.

Riverside merchants will suffer if the plant should be forced to shut down, as the company has a payroll of \$350,000 per year, employing between 200 and 250 men.

Attorney C. L. McFarland, for the defense, in discussing the opinion of Judge Densmore, said:

"The judgment will not be entered in the court for some thirty days. We hope to show the court that we are complying with the decision, so that the company will be allowed to operate in the future. It was shown in the course of the case that 95 per cent of all the dust emitted from the plant is now being caught. We hope with the improved dust collectors to adjust an increased percentage."

The court proceedings aroused statewide interest, after having been started on November 9, 1914, and continuing until the last of February of this year.

Prof. George J. Pierce of Stanford, Prof. T. Palmer of Los Angeles and other noted chemists were placed on the witness stand to show the effect of the dust.

Wesley H. Beach, one of the attorneys for Bridson, said last night that the cement company would probably find its remedy finally in buying the 100 or 150 acres affected by the dust in case they did not succeed in entirely preventing it from escaping.

A SUCCESSFUL EXCAVATOR

Paving contractors have long been looking for a real practical and economical excavator for sub-grade excavation for paving work. There is no doubt that the Maney Four-Wheel Scraper, one yard capacity, has filled this want.

The "Maney" is virtually a self-loading dump wagon. It is loaded and dumped by the driver by means of conveniently arranged levers. It thus effects a big saving in labor over the two-wheeled scraper. Its efficiency over the ordinary wheeler is estimated at from 50 to 100 per cent by Prof. McDaniels, of the University of Illinois, in his article in Engineering Record of Just 31st.



The Maney Four Wheel Scraper.

As a comparison with steam shovels it is interesting to note that Maney outfits this season have moved from 400 to 500 cubic yards a day. This was done at an investment of from one-third to one-half that of steam shovels. The cutting edge is adjustable to very fine depths, thus insuring an almost finished sub-grade.

The Maney is being used extensively by prominent paving contractors with splendid results. There are many big features about the Maney which are brought out in the catalog of the Baker Mfg. Co., 552 Stanford avenue, Springfield, Ill. This catalog, as well as guarantee proposition, will gladly be sent upon request.

*I've got
rid of those
edge-wearing guide
rollers - my Goodrich
conveyor belts run so
true. That saves power
and makes the belt
last longer.
- Supt. Wise*

Goodrich Conveyor Belts are economical belts to operate. They are built by engineers who know what a belt must do *for you*—to give super-service. Hundreds of big operators *know* this—and we enjoy their *continuous* business for that reason.

Out of 45 years of rubber experience and engineering study we have produced a Conveyor Belt that leads them all in strength, true-running, edge construction and lack of shrink or stretch. It's the

Goodrich LONGLIFE CONVEYOR BELT

This belt is cutting tonnage costs every day all over the earth. Its wonderful service qualities are giving maximum satisfaction in great plants and small—under all sorts of conditions. To it has been entrusted the *big load* by operators who have investigated—and found "Longlife" their *best belt buy*. It will pay you to do likewise.

Goodrich Products:

Conveyor Belts	Transmission Belts	Packing
Elevator Belts	Hose—all kinds	Valves, etc.

The B. F. Goodrich Company

Factories: Akron, Ohio



"Get in touch with Goodrich"



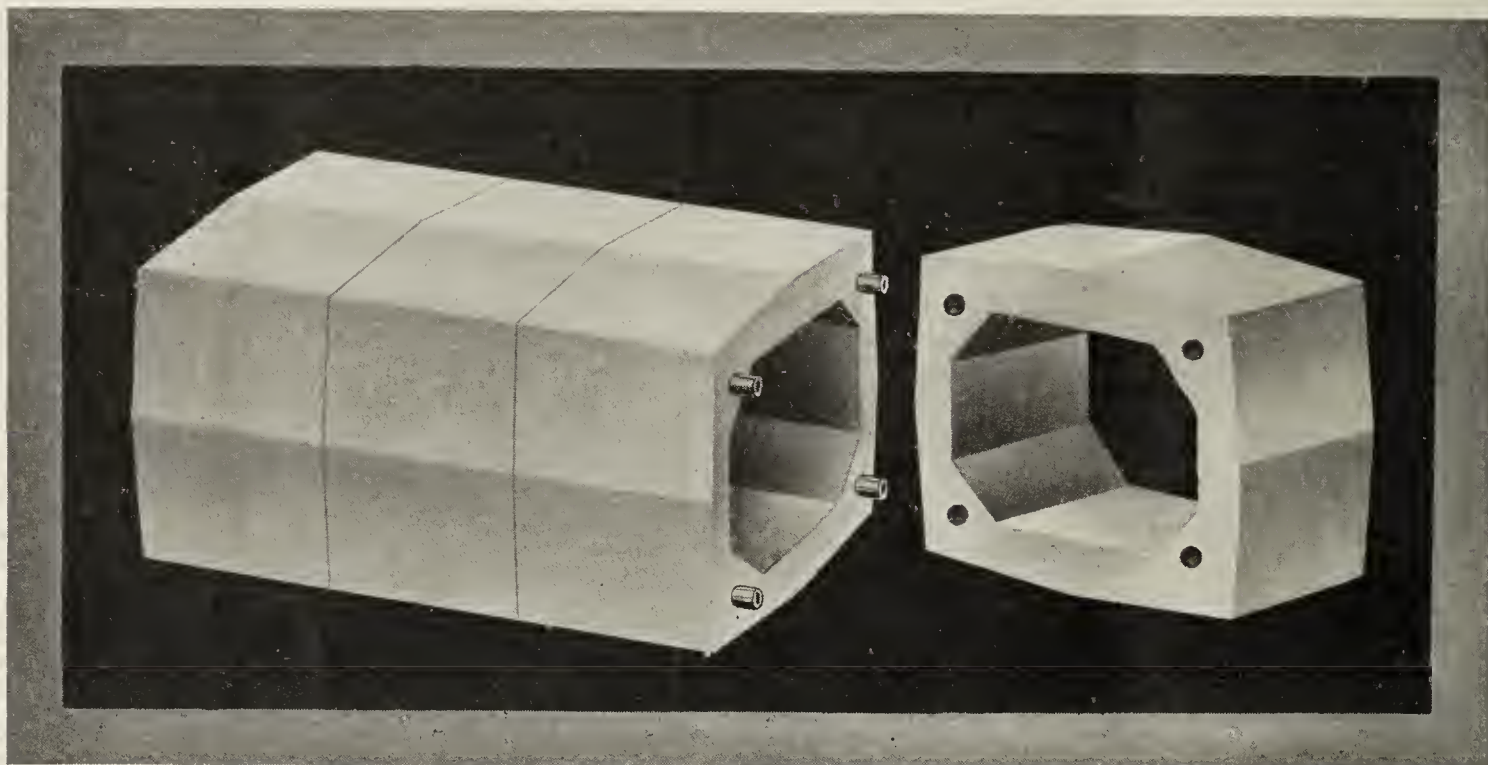
SECTIONAL CONCRETE CULVERTS

The Security Bridge Company, of Minneapolis, Minn., has organized a separate department to be known as the Security Culvert Company, which will promote a new type of concrete culvert.

This is a sectional, reinforced culvert, and considered one of the best on the market. Each section has four wrought iron pipes passing entirely through it, and engaging corresponding recesses in adjoining sections. Four steel rods are then passed through the pipe and through all the sections of the culvert, binding them securely together and preventing motion in any direction.

The pipes in the corners of each section not only provide a passage for the rods, but they also act as longitudinal reinforcing. The forms in which the culverts are made are designed to make it practically impossible to place the reinforcing in any other position than that called for in the design.

The company furnishes entire outfits of forms and tools for the manufacture of these culverts.



The Security Sectional, Reinforced Concrete Culvert.

WRITE FOR THIS BOOKLET

The merits of Medusa Waterproofed White Portland Cement, the only waterproofed white Portland cement manufactured in the entire world, are fully set forth in a booklet just issued by the Sandusky Portland Cement Company. It contains illustrations of residences in which this material was used for exterior stucco and concrete blocks, and also complete specifications for the use of Medusa Waterproofed White Cement, as well as other valuable information for architects, contractors and manufacturers of artificial stone.

Anyone interested in concrete construction should not be without this catalog, copy of which will gladly be sent on request. Write the Sandusky Portland Cement Company, Sandusky, Ohio.

CATALOG FOR SPANISH TRADE.

A catalog printed entirely in Spanish and which should result in placing its publishers in line with South American trade, is being sent out by Chalmers & Williams, 1457 Arnold street, Chicago Heights, Ill. It is devoted entirely to "Symons" Disc Crusher, which in Spanish is called "quebrador." It shows the various details of the "Symons" disc crusher and is amply supplied with descriptive matter and tables showing what can be expected of a machine in a given amount of time.

THE FOOTE-STRITE TRANSMISSION.

The Foote Bros. Gear & Machine Company of Chicago, the most successful manufacturers of tractors, developed, after a number of years of study, testing and development, the Foote-Strite transmission, a standard power transmission which solves the problem from the standpoint of adaptability, efficiency, durability, speed of construction and cost.

It is one of the most important tractor part developments of recent times and is the only one of its kind that will suit many different conditions and that can be used on almost any known type of two, three or four or more plow tractors made today. It is the only transmission on the market having a traction gearing and power pulley or threshing attachment combined in one case.

In their latest catalogue the Foote Bros. Gear & Machine Company describe and fully illustrate all parts of their tractors and power transmission, and invite interested parties to send for this publication.

STEEL CHAINS AND SPROCKET WHEELS

Book No. 124, just issued by the Link Belt Company of Chicago, illustrates and describes their Steel Chains and sprocket wheels, 9x6-in., paper, 40 pp., illust. As stated in the introduction, the manufacturers have made it a point to consider carefully every detail of design, material and construction entering into the manufacture of their steel chains. An endeavor has been made in the tabulated matter to furnish useful information as to details of size and construction of steel chains. Send for a copy of this book and mention Cement & Engineering News when writing.

STEAM SHOVEL REPAIRS

The Vulcan Iron Works Company of Toledo, Ohio, announce that they make special castings of all kinds to fit any make of steam shovels or dredges and at reasonable prices. They also manufacture dippers, dipper teeth booms, dipper bails, dipper arms and repair parts for all the various types of Vulcan steam shovels and dredges and have them on hand for immediate shipment. They make a specialty of dipper teeth made from 60 carbon steel, solid tooth, no weld. Write them regarding any new parts you need. They can save you money.

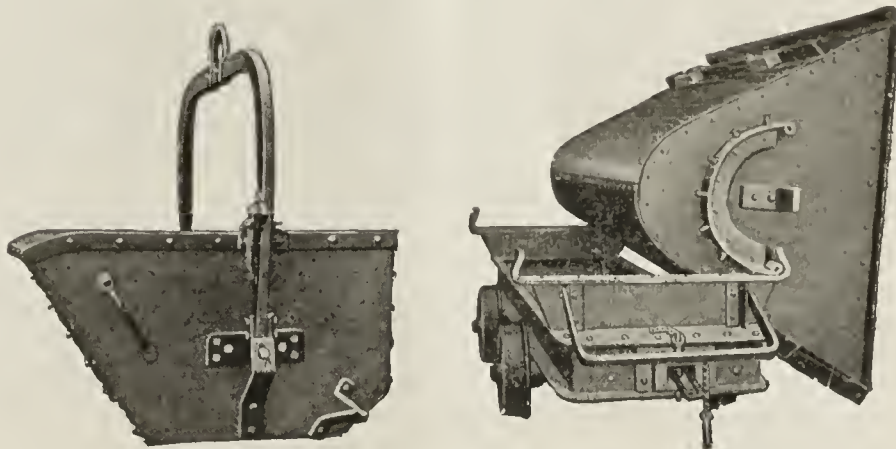
SACKETT CONTRACTORS' EQUIPMENT

A catalogue which should be of interest and value to every contractor is "Catalogue 32. Industrial Equipment and Contractors' Supplies," recently issued by H. B. Sackett Screen & Chute Company, 1679 Elston avenue, Chicago.

The catalogue first takes up concrete hoist tower equipment. In this section are included top and bottom tower sheaves, concrete hoist buckets, distributing hoppers and concrete chutes. The latter, known as



The Sackett Portable Revolving Screens With or Without Power.



The Sackett Contractors Tip Bucket and Dump Car.

"Sackett-Chicago" chutes, are of the open type, with reinforcing angles running the entire length along the top edges, and with heavy cross braces every 3 feet. All sections have bails for use with supporting cables and are provided with tie clips and punched angles for receiving truss rods and frame, if it is desired to convert several sections into one trussed chute. Chute details include remixing hoppers, continuous line chutes, swivel connections and flexible spouts.

Concrete carts are then taken up. These are of two

types, the Ideal and the Self-Dumping. The latter can be discharged without raising the handles. Two-way V-shaped dump cars of the rocker and cradle type are also shown, as are scoop cars, flat cars, portable track, switches, turntables and other track details.

Buckets of several different types are also shown. Among them are straight-side and round-bottom turn-over buckets, round-bottom bottom-dump buckets, taper-side bottom-dump buckets, contractors' tip buckets and stone skips.

Sand and gravel plant equipment occupies the next section of the catalogue. Belt conveyors and belting, bucket elevators of several types, stone and gravel screens, portable revolving screens with or without power, wire screen cloth, and sand screens are some of the types of equipment described.

The rest of the book is devoted to various contractors' supplies, among them hoists, pumps, car movers, wheelbarrows, car chutes, mortar boxes, form clamps, bar cutters and benders, and miscellaneous supplies, such as shovels, hoes, forks, etc.

"Light Weight"

BOSS

Steel King Mixer

Big Enough For Every Job

Price Low Enough For Every Purse

GEARLESS POWER LOADER

Automatic Stop and Brake

FULL SACK SIZE

1400 NOW IN USE

One hundred have re-ordered. Used by U.S. Government, British Government, Stone Webster Engineering Co., Westinghouse Church Kerr, City of Baltimore, Etc.

1,000 POUNDS LIGHTER—30% STRONGER THAN CAST IRON MIXERS

Steel Construction means light weight with maximum strength. Boss Mixers are practically unbreakable in service. Outlast cheap mixers, two to one.

ALL MODERN EQUIPMENT

Hyatt Roller Bearings. Novo or Ideal engines. Gearless Power Loader with Automatic stop and brake. Side or rear discharge. Sectional Chute to forms. Standard Remix action. Fast discharge. Two-way traction if wanted. 6, 9, 12 foot sizes. Gas, Steam or Electric power. Surprisingly low prices. Cash or payments. Write for catalog Today.

THE AMERICAN CEMENT MACHINE CO.
9635 Johnson St., Keokuk, Iowa

THIS MACHINE IS EQUIPPED WITH HYATT FLEXIBLE ROLLER BEARINGS.

New Rear Discharge Model With Sectional Chute

Gearless Power Loader Automatic Stop and Brake

Stock Carried In Principal Cities

How to Sell Concrete Burial Vaults



N INDIANA manufacturer of burial vaults was asked what he thought of the future of this business. His reply was an enthusiastic one, and even though paradoxical, there was no possibility of misinterpreting it.

"The future of the burial vault business is already here," he said.

This man went on to explain that in his first year of business, which was 1912, he sold seven vaults. The second year he sold about twelve times as many, while 1914 showed another substantial increase, and the present year bids fair to carry him way beyond last year's mark—unless, indeed, the people of his community should discover the long-looked-for elixir of life, or some other equally unexpected circumstance should happen.

This man gives it as his opinion that if the vault business does not thrive, there are just two men who are responsible, the two men who must work together to push this form of indestructible burial vault—the manufacturer and the undertaker.

It is pretty generally conceded among all successful manufacturers of burial vaults that it is only through the co-operation of undertakers that these vaults can be marketed successfully.

This means that the undertaker should get a certain definite percentage on each vault. This percentage should not be considered as any form of graft or anything other than a legitimate profit on goods which pass through his hands. The undertaker is, in a real sense, the dealer through whom the vault is marketed, and it is as legitimate that he should make a profit on the vault as on the casket which goes into it.

In the day or two preceding a funeral, the relatives of the deceased are in no mood to go around from one dealer to another bargaining for the various things which may be needed. They have, therefore, come to look to the undertaker to attend to all these things, even to the getting of the carriages, and in some cases the securing of the cemetery lot. On at least most of these the undertaker makes a profit, as they are in addition to the work of taking care of the body and conducting the funeral, the things upon which his charges are based.

Of course any first-class undertaker knows his business sufficiently to refrain from an out-and-out sales talk at such a time. But those who employ him expect him to suggest the various possibilities for the proper preservation of the body, and very often the mere suggestion of the enduring qualities of concrete will create a demand for this kind of a vault.

Sometimes the undertaker will be willing to carry a sample vault in his rooms, just the same as he very often carries only a sample line of caskets, especially of the more expensive patterns, ordering them by telegraph as occasion arises. The sample burial vault may be either a full sized vault or a small model. In the latter case it can be allowed to occupy window space, at least a part of the time, and thus attract the attention of the general public. Where circumstances permit, even a full sized vault can be put on occasional exhibition, never failing to draw attention, and the recollection of it will come to mind when some relative passes away.

The manufacturer above referred to, who is doing a general concrete contracting work and making a number of cement products, says that the burial vault business is developing so rapidly that he expects in a short time to be obliged to devote all his time and attention to it. Other manufacturers are having the same experience.

The reason this man sold only seven vaults the first year was because he depended upon the cemeteries to push the business for him. Then he woke up to the fact that these seven had been sold because the parties insisted upon having them and that the cemeteries were "knocking" his product and pushing slate and stone for this purpose. The cemetery directors even tried to intimidate him by telling him it was the rule that only slate, marble or stone would be allowed in the cemetery. They tried to enforce this by locking the gate on him; but fortunately he is a man who is not daunted by such things, and eventually he won out.

It is recognized among many manufacturers as of considerable importance, too, that men of intelligence be on hand at the time of the funeral to seal the vault when the services are over. An ordinary laborer could, of course, do this just as satisfactorily; but there will always be a number of relatives and friends who will linger behind to see the vault closed, and who in many cases will want some explanation of the vault itself. It is, to be sure, no occasion for making a sales talk; and yet the mere statement of the purposes and merits of the vault will be sufficient to leave a lasting impression with many. Some manufacturers even carry circulars with them on occasions of this kind and find that they can often hand them out without giving offense. It scarcely seems that this could be so, and it is probably explained by the fact that grief has caused the survivors to consider everything pertaining to the care of the body of the deceased as of paramount importance and they take a somewhat morbid interest in knowing all the details of such care. It is often possible actually to trace subsequent sales to the few words of explanation which have been given at a time of this kind.

By keeping in touch with undertakers in surrounding towns a manufacturer can largely extend his business and will have orders coming in by mail and telegraph at an increased profit without any increased overhead, and with several dollars of "velvet" to the undertaker, which is inclined to keep him in a favorable frame of mind. Where an undertaker is found who persists in trying to discredit the concrete burial vault, it is just as well to let him alone for a while, depending on the use of these vaults in surrounding territory to create a demand which will eventually bring him to time.

Newspaper advertising, moving picture advertising, window display, and various other methods have been resorted to by many manufacturers, all of them helping to create a demand and making it easier for the undertaker to book the order. But it is well never to lose sight of the fact that the undertaker is the man who is at hand when the real need arises, so that he must be cultivated and made friendly wherever possible.

It goes without saying that the manufacturer must make a good product in order to hold his business. And not only must the vault be strong, durable and well waterproofed, but it must be neat in appearance, preferably made in metal molds, which give a much better finish, and treated with some kind of a coating both outside and inside. It is also well to have some very satisfactory means for handling and hauling the vaults, so that there may be no hitch or delay in the proceedings at any point, and so that the public may not get the idea that these vaults are heavy, cumbersome and difficult to manage.

Then, too, the manufacturer should be sure to keep on hand a sufficient stock of the various sizes to meet demands. It is a waste of advertising effort to create a demand for a product and then not be able to supply it, and one order lost directly in this way will probably be the occasion of losing others indirectly.

CONTRACTORS FOR LUTEN DESIGN AND OTHER REINFORCED CONCRETE BRIDGES

The Ross Construction Company, Sacramento, Cal., which was recently awarded the contract for a large bridge at Red Bluff, Cal., has been in the engineering and contracting field for the past fifteen years. The company last year constructed the American River, Luten design bridge, at Sacramento, Cal., \$120,000, and in 1913 built the Stoney Creek bridge, also Luten design, at Orland, Cal., \$115,000. In addition it has built numerous other concrete and steel bridges, levees, wharves and foundations throughout California. The bridge at Red Bluff will comprise thirty-two 80-foot concrete arch spans, with 21-foot roadway and 4-foot sidewalk. The contract price is \$109,000. The firm is composed of Mr. Charles R. Ross and Mr. George G. Pollock.

CONCRETE CULVERTS

Phil Easterday and associates, Ainsworth building, Portland, Oregon, have had a successful year in manufacturing reinforced concrete culverts on special orders for highway work in Oregon and Washington. Business is done under the name of the Concrete Culvert Works, with one plant at Vancouver, Washington, and another at Astoria. This type of culvert is reinforced with American Steel & Wire Company's triangular mesh, and Clinton steel wire fabric. The culverts are made in 4-foot sections, connected by flexible joints, covered by Easterday's patents. This is an elastic coupling consisting of rods imbedded in the concrete, with loops and coils at the protruding ends, these being held together by spring pins. This makes a tight and firm joint under normal conditions,

but is sufficiently flexible to prevent rupture of the pipe in case of uneven settling of material overlying the culvert.

About 4,500 feet of these culverts have been installed on the Columbia highway, in Oregon, between Portland and Astoria; and close to 1,000 feet on the same highway between Portland and Hood River county line. The engineers on this work have been highly pleased with the Easterday culverts. Besides, about 2,500 feet of same culverts were supplied for the Pacific highway in Washington. In all this work the specifications have called for culverts of 12-inch to 60-inch diameter.

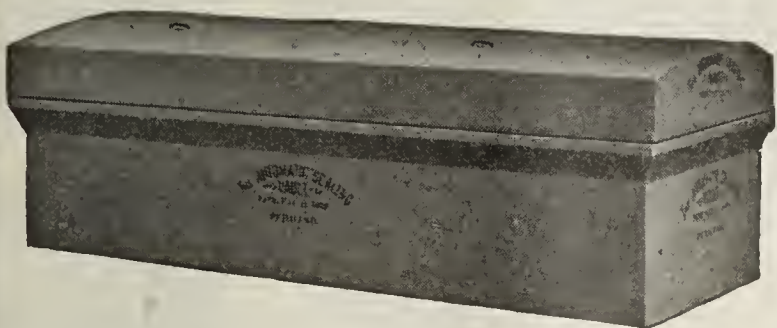
COMPLAIN TO STATE BOARD ABOUT SWITCHING CHARGES ON STONE AND GRAVEL

The Dunbar Stone Company, Ferdinand Porath & Son, Thomas R. Currie and E. Jacques & Sons of Detroit complained against the Michigan Central, the Grand Trunk and the Lake Shore systems, claiming their switching charges in the city of Detroit for carloads of sand, gravel and crushed stone were too high. The railroad commission will set a date for a hearing on the matter later.

The question of the interswitching charges on gravel and stone in Detroit has been up before the commission several times, but has never been settled.

SANDUSKY PORTLAND CEMENT COMPANY MOVES TO CLEVELAND

The Sandusky Portland Cement Company, Sandusky, Ohio, announce the removal of their offices from Sandusky, Ohio, to Engineers building, Cleveland.

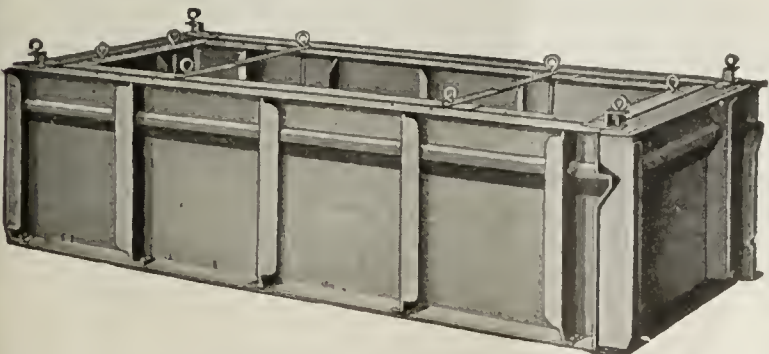


The Vault that SELLS

We show above an illustration of our vault. Note the smooth finish which is given to it by the machine—no troweling necessary. This vault sells easily on its fine appearance and its very evident strength and prominence. The lid seals onto the body automatically and positively.

The Machine that Makes It

This machine is adjustable so you can make any required size of vault with it. There isn't a seam or a rivet or a nut on the inside to mar the finished product. You can see that the side molds are heavily reinforced—that means strength and durability.



Honest, now, why not look into this big business opportunity right now—learn all about its possibilities?

If you have never looked into the burial vault business, you haven't any idea of its possibilities. If you have simply investigated one system of vault manufacture you may have drawn wrong conclusions.

Hundreds of plants in this country are turning out our type of burial vaults and making a nice annual profit. It's a manufacturing proposition, pure and simple, requiring a limited amount of capital, small factory space and practically no sales organization. Your regular force of men can manufacture the product at odd times. This work can be done in any corner of your plant.

The demand for your product keeps up the year round, and is unaffected by general business conditions. You sell your vaults in large lots and not to individual purchasers. Aren't those features descriptive of a first class business opportunity?

This big book tells HOW

We manufacture machines for making vaults. Our book on the burial vault business is not large, but it contains a mass of information on the very points you are most interested in. It tells just exactly how the vaults are made, what the manufacturing cost is, how they are sold and for how much. It describes a number of successful plants now in operation and our present customers tell their own stories. Write for a copy of this book today.

AUTOMATIC SEALING VAULT CO.
209 East River St. - - - Peru, Ind.

We Serve the Contractor from "Soup to Nuts"

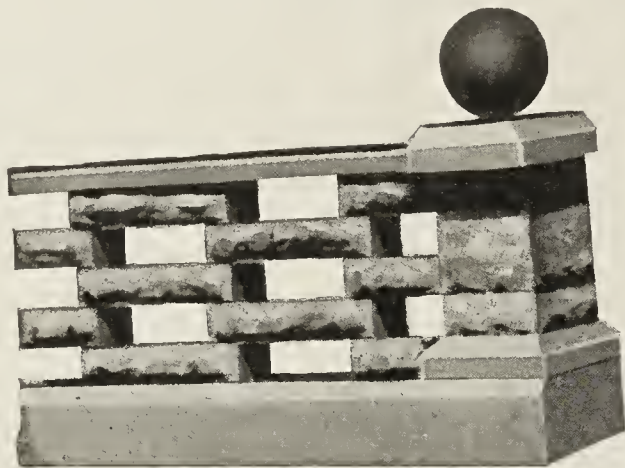
It is the equipment that has placed contractors upon their feet and kept them there. For unsentimental contractors who consider the purchase of a mixer, a mould or a wheelbarrow as an investment, not an expense—who purchase results—we offer:

Lansing Batch Mixers
Lansing Continuous Mixers
Lansing Cement Tools
Lansing Drain Tile Machines
Lansing Brick Machines
Lansing Fence Post Moulds

Lansing Silo Forms
Lansing Block Machines
Lansing Burial Vault Moulds
Lansing Ornamental Moulds
Lansing Wheelbarrows
Lansing Hoists

Lansing Hods
Lansing Tool Carts
Lansing Concrete Carts
Lansing Scrapers,
Etc. Etc.

Southern Factory—Parkin, Arkansas
Boston—78 Cambridge St. Charlestown District
Chicago—169 West Lake Street
Kansas City—1413-1415 West Tenth Street
Philadelphia—Willow and No. American St.
New York—288-289 West Street
Minneapolis—517-519 Third St. N.
San Francisco—338-348 Brannan St.



WRITE FOR CATALOG 3540 JUST OUT

LANSING=COMPANY

Lansing, Michigan



SAVE \$100—WHY NOT?
"The Quality Mixer at the Right Price"



The Bottom Knocked
Out of High Mixer Prices

Buy the
Republic "Six"
at
Your Own Price

When quality and price meet you get an investment worth while

See Catalog showing

**LOW CHARGING HOPPER
BATCH HOPPER
POWER LOADER
HOISTING ATTACHMENT
SPOUTING ATTACHMENT**

**\$100
TO
\$295**

The strongest and best built mixer of this class on the market. Put it in use anywhere. Haul it over the roughest roads. Put it up against any mixer regardless of price for quickness and thoroughness of mix and if you don't find it a bigger, better mixer in every sense of the word, send it back and we will refund your money.

Guaranteed REPUBLIC "SIX" Insured

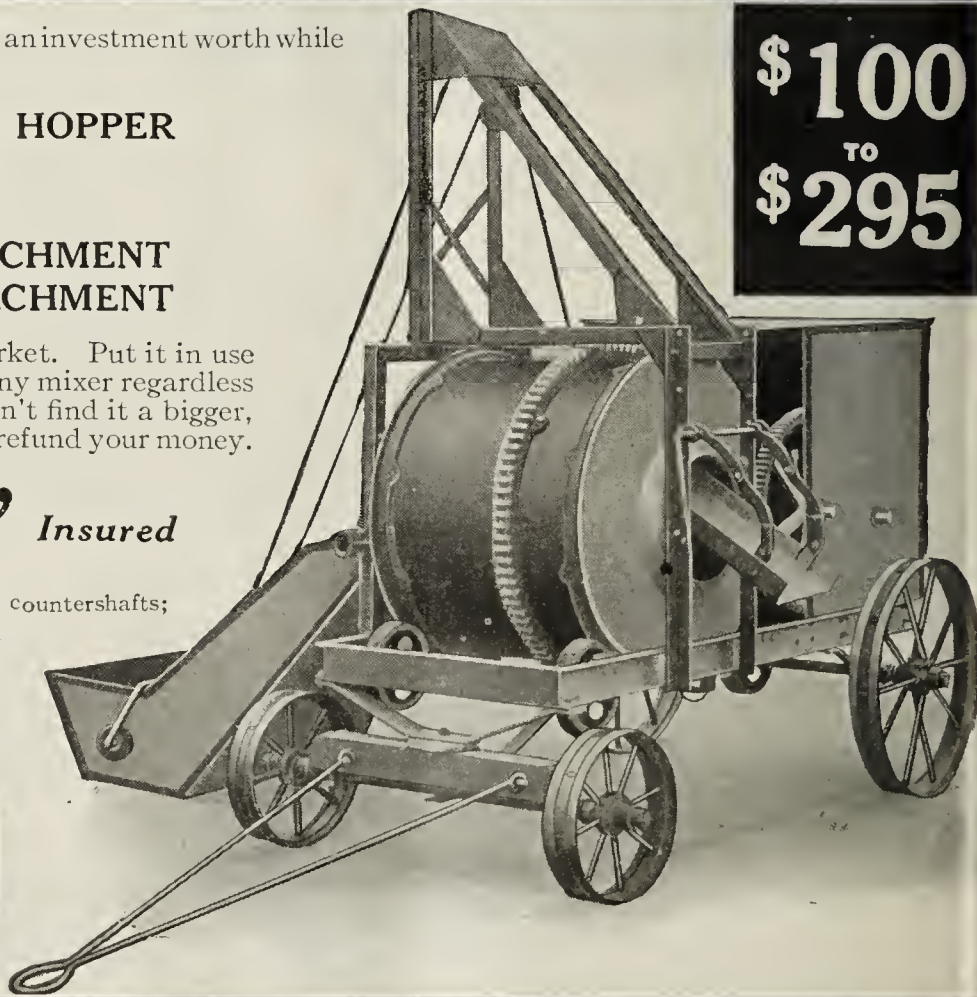
Notice this high grade construction—5-inch steel channel frame; steel countershafts; steel gears; frost and dust proof engine; 30-inch x 4-inch rear wheels; gearless power loader; light weight; low charging hopper; a 30-second mixing drum—everything like the \$2,000 pavers.

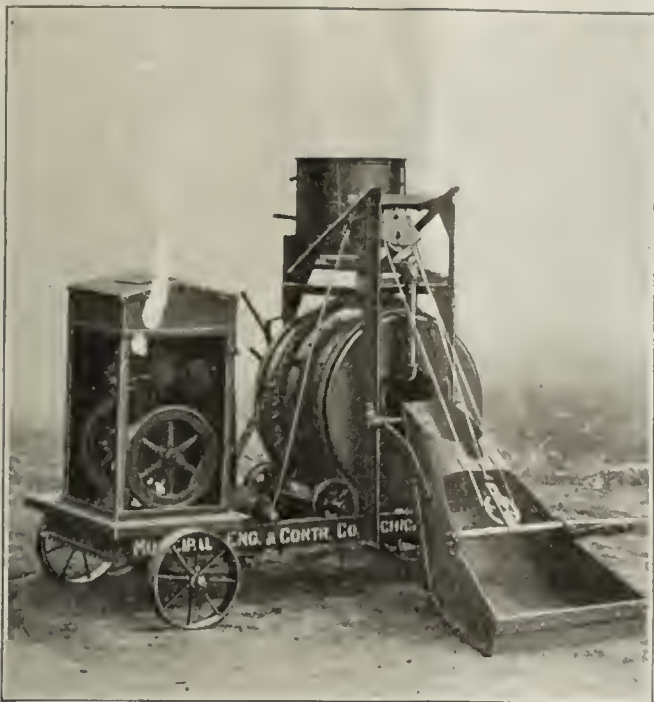
You can't go wrong on this mixer. Write today, *before you forget* and let us tell you in how many ways the REPUBLIC "SIX" will make and save money for you.

THE REPUBLIC IRON WORKS

TECUMSEH, MICH.

PITTSBURGH, PA.





Efficient Concrete Mixing at a Small Investment

That's what the New Austin Drum Mixer makes possible. Built to meet the requirements of contractors who demand an *efficient* but *inexpensive* mixer, it produces super-excellent concrete in *great volume* and insures long, continuous service at *low cost of production and maintenance*.

AUSTIN Drum Mixers

embody the same mechanical superiorities that have made Austin Cube Mixers famous around the world. The drum is built of riveted heavy blue enameled steel plates and is *extraordinarily strong* owing to the arched construction of the end discs. The circumferential rack and flanged roller tracks provide still further rigidity and insure practical indestructibility. Will mix a 1-2-4 mix and has a capacity of from 60 to 80 cubic yards a day. Operated by $3\frac{1}{2}$ horse power gasoline engine in steel house. Equipped with charging elevator and 20 gallon water tank. Charging hopper will hold a full batch. Mounted on portable truck unless otherwise ordered. Weight, 2,500 pounds. *And for a mixer like this we ask only \$325.* If you're in need of an intermediate sized mixer you *can't afford to pass this one up.*

Write for bulletin No. 21-D which gives full details.

Municipal Engineering & Contracting Company

New York Office: 30 Church St.

Main Office: Railway Exchange Bldg., Chicago

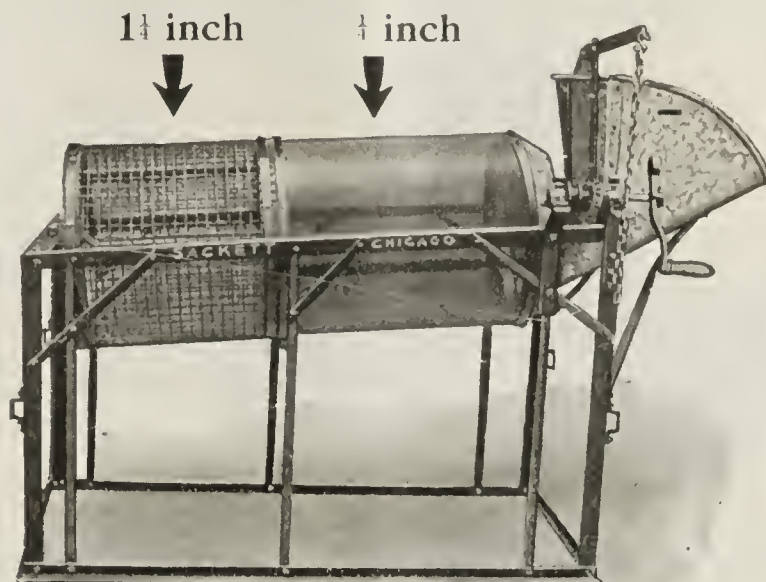
New England Agents, Dyar Supply Co., Cambridge, Mass.
Western N. Y., Henry W. Littlefield, Buffalo, N. Y.
Western Pa. and Eastern Ohio, J. S. Beckwith, Pittsburgh, Pa.

Maryland, Va., No. and So. Carolina, R. C. Hoffman & Co., Baltimore, Md.

Inter-Mountain District, H. N. Steinbarger, Denver, Colo.
Washington, F. S. Burbank Co., Seattle.
San Francisco Office, 473-485 Sixth street.

(AGENTS WANTED IN OPEN TERRITORY)

Bank-Run Gravel seldom has the right proportions



Since there is usually too much sand in proportion to the pebbles, *Cement is Saved* and a better concrete obtained by screening the sand from the pebbles and then remixing them in the right proportions. All pebbles larger than $1\frac{1}{4}$ inches are usually discarded. All material less than $\frac{1}{4}$ inch is considered sand.

A Sackett-Rotary does this in one operation for you.

Send for our Special Screen Circular.

H. B. Sackett Screen & Chute Co.

Main Office and Shops
1679 Elston Ave.
Chicago.

Branch Warehouse
195 Medford St.
Charlestown, Mass.

STOP! LOOK! LISTEN!

Just the Mixer You've Been Wishing for

THE BIG-AN-LITTLE



Just a little bit better than the one you thought was best

1915 Model NOW READY

The small mixer has proved its worth. Contractors see that it pays better to have one or more small portable mixers than to mix by hand or to have a great big clumsy mixer. The question has been to get a **DEPENDABLE** Small Mixer at a low price.

The **Big-an-Little** is the biggest and best small mixer on earth, and our low prices amaze the mixer world.

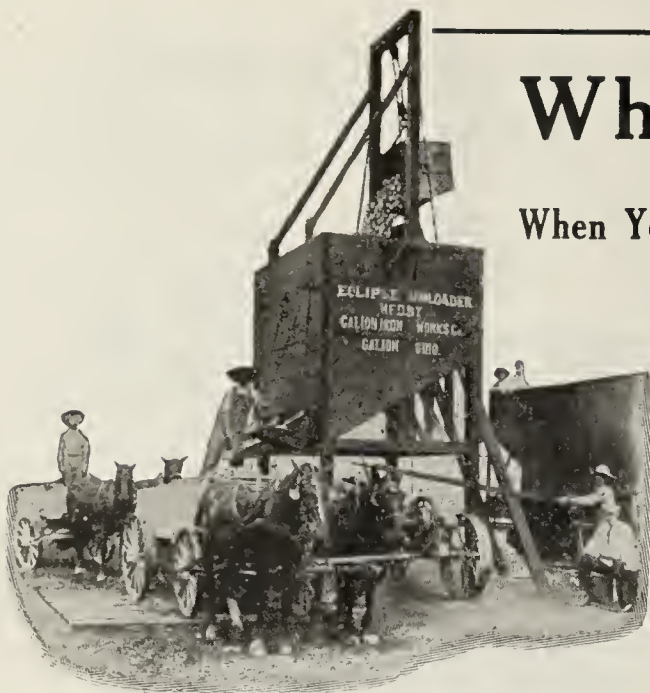
Your neighbor has one. They are used everywhere. Ask him.

Write us

The Jaeger Machine Co.

212 W. Rich Street

Columbus, Ohio



Why Unload Material by Hand

at a Cost of 15c to 20c a Yard?

When You Can Unload Material from Cars to Trucks with an Eclipse Unloader at a Cost of 2c a Yard

The Eclipse Portable Stone Unloader does this by unloading your Crushed Stone, Gravel, Sand, Slag, Coal, etc., from Hopper Bottom Cars to wagons at the rate of 10 Cars per 10 hour day. Your wagons or trucks are loaded in $\frac{1}{2}$ minute instead of $\frac{1}{2}$ hour—by one man instead of 10 or more shovelers. No delays, no waiting for loads—your drivers and hauling equipment are kept busy all the time.

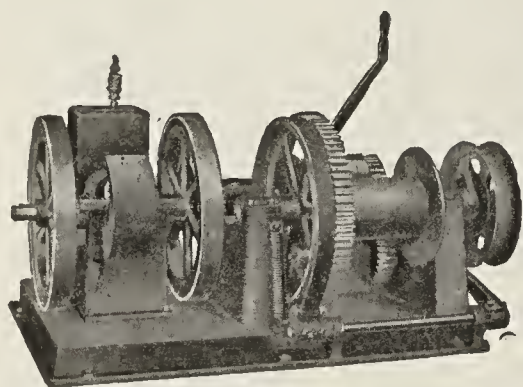
The Eclipse Portable Stone Unloader is saving contractors thousands of dollars annually. Go over your cost records and figure how much money an unloading cost of 2c a yard would save you—then write for all the facts.

THE GALION IRON WORKS & MFG. CO.

Home Office & Works, Galion, Ohio

BRANCH OFFICES: New York, Harrisburg, Enid, Okla., Richmond, Atlanta, Durham, N. C., Moberly, Mo., Philadelphia, Pittsburgh, Chicago, Baltimore, Milwaukee, Memphis, Des Moines.

BUILDERS' HOISTS and MATERIAL ELEVATORS



Hoist and Engine complete, direct connected, three sizes, 5, 6 and 8 H.P.

Every up-to-date builder and contractor should post himself on the most economical way to elevate building material. We have prepared an interesting booklet on

HOISTS and ELEVATORS

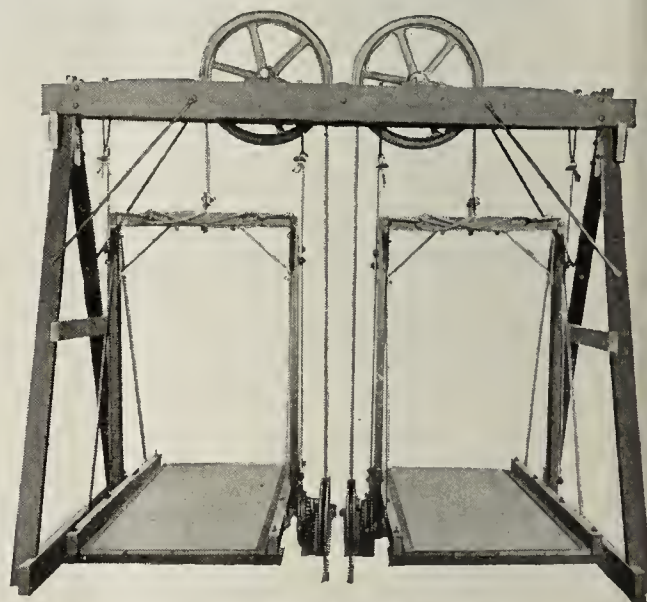
which we will send to anyone interested.

Write for it.

Bates & Edmonds Motor Co.

114 Hill Street

Lansing, Mich., U. S. A.



Double Platform Elevator for any Elevation



Silo Roof Facts

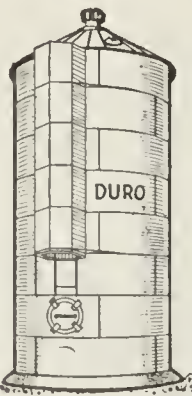
THAYER'S Self-Supporting Opening Silo Roof has solved the silo problem for silo owners. Adds 25 per cent capacity to a 24 foot silo. A 12 section metal Roof attached to 24 Rafters that OPEN OUT leaving Top of Silo open and FREE from cross-pieces, post or braces.

As all Our Roofs are Erected from the Inside of Silo, the Same Platform that is Used In Building Silo can be Used to place Roof on Silo. Our Patent Rafter-Irons are the HANDIEST, STRONGEST and Easiest way to FASTEN a Silo Roof to a Cement Silo known of. Fastened with set screw bolts. For Sale by Silo Contractors, Silo Mfg., Silo Agents, or direct to you where we have no agents.

Agents Wanted. Write for catalog and prices.

H. M. THAYER CO., Woodhull, Illinois

"DURO" METAL Tops—Doors—Frames and



Forms for Erecting
Concrete Silos and Tanks
PURE IRON GALVANIZED

will last as long as the silo.
Write for prices. Manufactured
only by

**C. C. Fouts Co., 220 Canal St.
Middletown, Ohio**



Our Molds and Construction Patented

USE PEERLESS SILO AND PEERLESS WALL MOLDS

Peerless Silo Molds are the largest daily capacity molds on the market, building 7½ ft. daily, including chute, with same labor and cost as others build 4 to 6 ft. This means 3 to 5 days labor expense and time saved on every silo. It means one extra silo every month, the profits from which will PAY for a Peerless Mold in one season. THINK THIS OVER, and write for Peerless particulars.

Use Peerless Wall Molds and stop wasting lumber. Barns as well as silos should be of concrete. HERE IS TO THE ALL CONCRETE FARM BUILDINGS. Ask us about them.

New Enterprise Concrete Machinery Company
68 W. Monroe Street Chicago, Ill.

CAREY

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 REG. U.S. Patent Office.
 EXPANSION
JOINT
 "The Sandwich Joint"

Used to take care of expansion and contraction in concrete roads and streets.

Thousands of feet installed during 1914. We will gladly tell you where.

Write for sample and literature.

"Remember We Are the Pioneers"

THE PHILIP CAREY COMPANY
 23 Wayne Ave. Lockland, Cincinnati, O.

Everybody Is Buying
 Them

"PIONEER"

Expansion Joint Compounds

Because they are uniform throughout, economical to lay, unaffected by climatic conditions, and

Because they know that "Pioneer" quality means something.

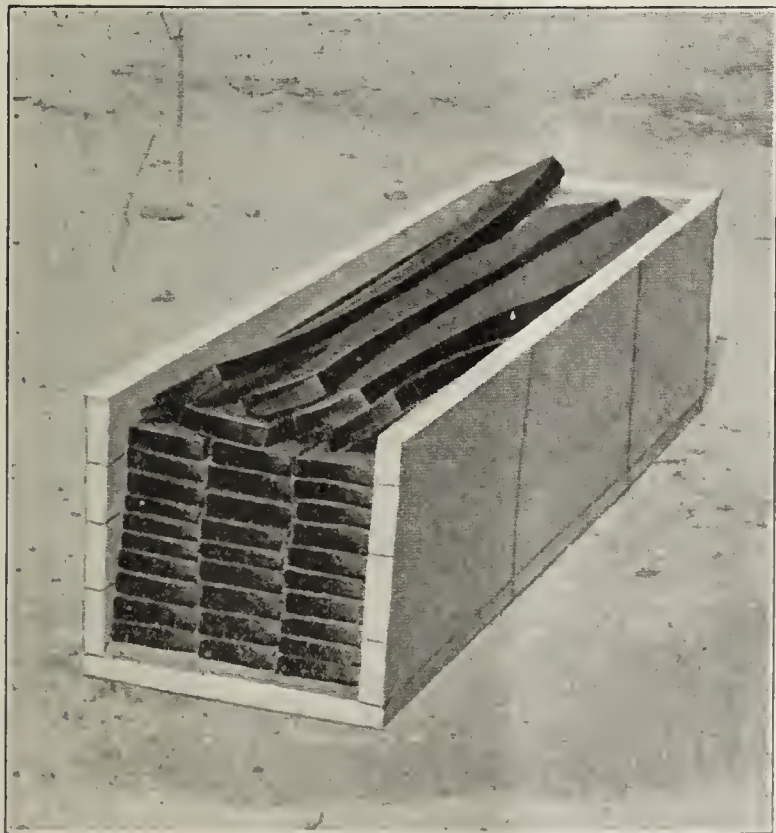
Get a sample and price
 before buying elsewhere

THE PIONEER ASPHALT COMPANY

Producers of highest quality bituminous products

LAWRENCEVILLE, ILL.

Genasco Expansion Joints



have all the advantages of other prepared joints for concrete, wood-block, brick and granite-block pavements—**economy, ease of installation, the avoiding of melting and pouring**—and besides this

Are All Asphalt

The **entire thickness** of a Genasco joint serves the purposes of expansion and contraction. Ready-made joints that contain felt or some other form of re-enforcement cannot do the work of the Genasco all-asphalt joint. Any thickness or depth.

The best way to judge this joint is to see it. A life-sized sample will be sent to any one interested. Write for it today.

THE BARBER ASPHALT PAVING COMPANY
 Philadelphia, Penna.

SLAG from blast furnaces for Concrete

Blast-furnace slag used as an aggregate in concrete represents economy, safety and strength

For many reasons, blast-furnace slag is an ideal concrete material—its alkaline nature, tending to prevent rust in reinforced concrete—its light weight, enabling it, in floor slabs for instance, to support a given live load with smaller dead load on supporting frame—its contents of silica, alumina and iron, which increases the permanency of any concrete of which it is a part—its fire-resisting qualities—these are some of the features which have impelled the most careful engineers and architects to specify slag in place of other concrete aggregates.

The high crushing strength of slag-concrete has been demonstrated in various tests made of unprejudiced parties in nearly every large city. Slag-concrete has always developed strength uniformly higher than gravel-concrete or limestone-concrete.

Engineers and Architects

Blast-furnace slag as a concrete material is better understood than it used to be. Before you write your concrete specifications, get in touch with any of the following competing producers of blast-furnace slag—let them submit the results of long-time tests of slag-concrete.

Birmingham Slag Co.
1001 Woodward Building
Birmingham, Ala.

The Sommerfield Co., Inc.
1863 61st Street
Brooklyn, N. Y.

The France Co.
Second National Bank Bldg.
Toledo, Ohio



The Commonwealth Power Co. tunnel under Grand Ave., Milwaukee, Wis., recently successfully waterproofed with

“Hydrite”

COLORLESS WATERPROOFING

Hourly Leakage 5200 Gallons STOPPED! 700 ft. Concrete Tunnel 55 feet below datum was made watertight.

The success of our method eliminated the necessity of pumps and SAVED \$80.00 to \$100.00 PER MONTH.

In addition to the possibility of damage to the cables, etc., from the seepage. This tunnel, 10 years old, has been free from leakage for nine months, or since work was completed. We guarantee it to stay so.

HAVE YOU A WATERPROOFING PROBLEM?

Difficult waterproofing problems in NEW or OLD work can be economically and successfully solved. The experience of a successful organization is at your service and satisfactory results are guaranteed.

Our method of applying grout, internally or externally, under heavy pressure through pipes, or upon the surface, as the conditions require, is applicable to tunnels, reservoirs, foundations, basements, etc., of masonry or concrete construction. Leaks are not only stopped but the structures are strengthened.

Let us help you with your waterproofing problem. Write us concerning our product and methods. Ask for descriptive booklet.

WATERPROOFING COMPANY OF AMERICA
MILWAUKEE, WIS.

Branch Offices:

543 McCormick Building, Chicago. Callahan Bank Building, Dayton, Ohio.
1014 Transportation Building, Montreal, Canada.



MARION COUPLINGS

Splice Your Bars

Save Steel

GIVE continuous reinforcement with positive lock and additional bond.

FORM TIES made with short sections of bar may be removed after concrete has set, leaving no steel protruding.

Stock Shipments—Low Prices
Send for Samples

The Marion Malleable Iron Works
Marion - - - Indiana



The Reason Why You Are Not Making Cement Drain Tile Is Because You Have Not Yet Investigated Its Possibilities

The superiority of cement tile for drainage purposes is known; there is no competition in quality or price. For this reason its future use is assured, as well as its present use.

The cement drain tile business does not require a large investment—nor skilled labor—nor hard selling. A few hundred dollars will start you right; you can use unskilled labor; you can sell all the tile you manufacture without any difficulty.

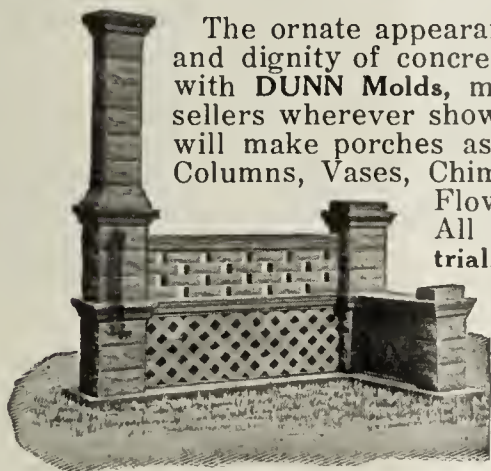
And we are prepared to guarantee profits ranging from \$230 to \$800 a month.

Ask us today for printed proof of comparative costs and profits in making tile; we send this information free upon request.

Dunn equipment is sold on 15 days' trial; write for the tile equipment catalog. Price of Dunn No. 1 Tile Machine.....

\$165

Concrete Porches Pay a Bigger Profit Than You Think.



The ornate appearance, permanence and dignity of concrete porches made with DUNN Molds, make them ready sellers wherever shown. Dunn Molds will make porches as illustrated, also Columns, Vases, Chimneys, Balusters; Flower Boxes, etc. All sold on 15 days' trial.

Write for Porch Mold catalog today. Price of outfit for making porch as shown,

\$39

Don't Tamp Sewer Pipe—POUR IT!



Tamping a semi-dry mixture, to make large drain tile and sewer pipe, is not only slow, troublesome and costly—but unnecessary. Pouring a wet mixture into DUNN Molds, besides being the most efficient method, assures the strongest product. Reduces manufacturing costs, too, and increases the profits.

Dunn Molds permit the manufacture of all size pipe, from 6 to 36 inches in diameter. All sold on 15 days' trial: Pipe Mold catalog gives full descriptions and prices, ask for a copy. Price of 12-inch mold.....

\$7.50

Price of 4-mold battery.....



Pat's No. 842262 and 782700

Here's Mixer Value Out of the Ordinary

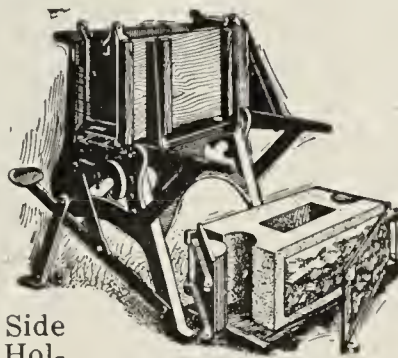
Let facts—not claims—influence your buying judgment. You buy concrete mixers because of what they are, not because of what they are claimed to be. To learn about the Dunn construction is to learn the reasons why a DUNN Mixer is the mixer you have waited for.

Dunn Mixers have four mixing blades and extra long drums, giving them the highest possible mixing efficiency. The convenient loading height and the power discharge feature, save labor. Their capacity—a batch a minute—is assurance of ample speed. The one-piece hollow yoke makes the operation almost noiseless. The all steel and iron construction is evidence of long life.

Write today for catalog describing all styles and sizes. We sell on 15 days' trial. Prices.....

\$67.50 to \$224

Use Three Block Machines—but Buy only ONE



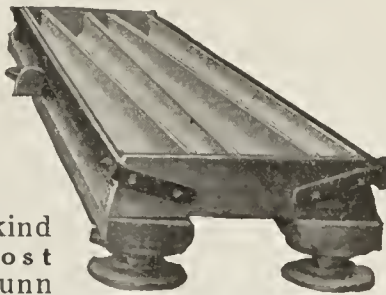
To make Face Down, Side Face and Two-Piece Hollow Wall Cement Blocks usually requires three machines. But one DUNN Combination Cement Block Machine will make all three types. Saves two-thirds the usual investment.

By using a wet mixture it saves considerable tamping, and makes a stronger block. And a special off-bearing system protects each block against breakage. Capacity, 150 blocks daily.

Sold on 15 days' trial. Write for Block Machine catalog. Price.....

\$40

The Concrete Fence Posts that Sell the Quickest



Are those of high quality and moderate price. These are the kind that DUNN Fence Post Molds made. The Dunn system enables quick and economical manufacturing.

Tamping is eliminated by our special Vibratory Base which compacts each post to uniform density and firmness. Made in batteries of four and ten. Sold on 15 days' trial.

\$12.50

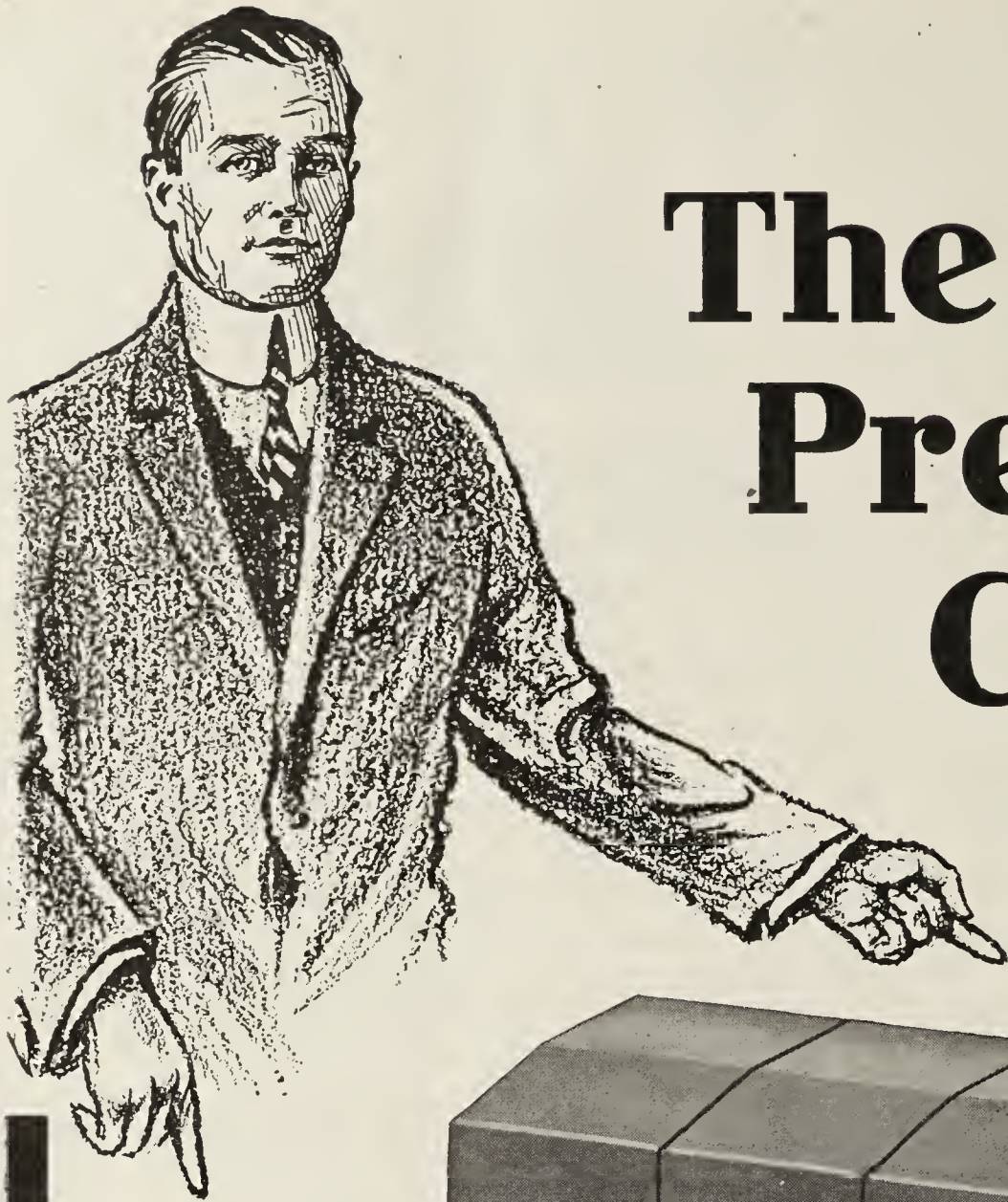


W. E. Dunn Mfg. Co.

4139 Fillmore St.,

Chicago

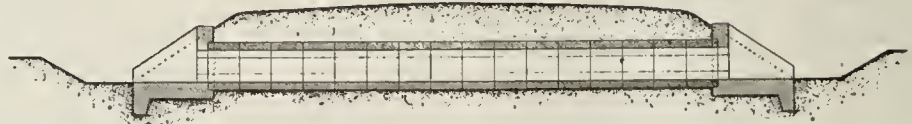
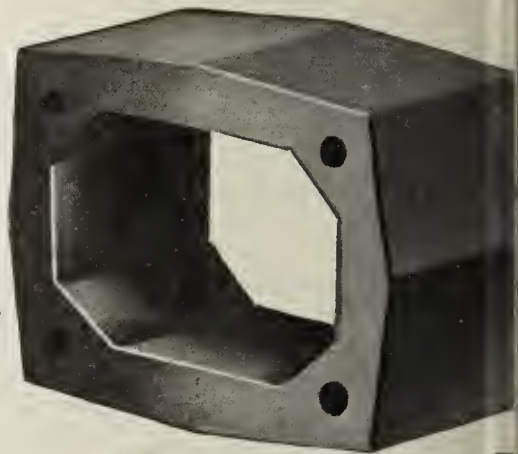
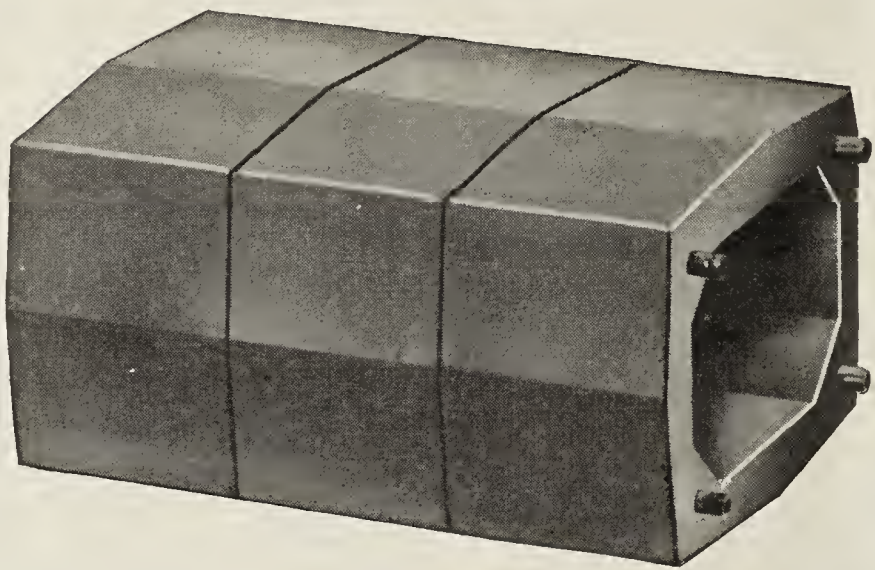




The Security Premolded Culvert

An Effective, Permanent and Economical Culvert

Where Concrete Material Is Available These SECURITY Culvert Units Can Be Made Under Our System for Less Cost Than Temporary Culverts.



THE use of premolded units of reinforced concrete for road, railroad and other culvert work is becoming more popular, due essentially to the economy and the exceedingly satisfactory results attained by their use.

The Security Premolded Culvert is the only sectional, premolded, reinforced concrete culvert now on the market that fills all the necessary requirements of a well designed type of culvert.

The units of the Security Culvert can be molded anywhere conditions permit, on the job, in your plant, or placed out on contract

with some concrete products manufacturer. These units can be shipped, like blocks, staves or tile, to the job and erected. The Security Culvert unit is properly designed to resist bending and securely fastened to prevent motion of any kind in any direction when assembled.

The forms in which the Security Culvert units are made are designed to prevent any mishap in the arrangement of reinforcing, and also to prevent any variation in the thickness of the unit.

These features insure full strength and make our system fool-proof.

We will furnish the entire outfits of forms and tools necessary for their manufacture, provided you want territorial rights. Here's your opportunity to secure a most modern and a most splendid system of culvert construction yet devised. It is up-to-the-minute. Once seen always in demand. The enterprising man of your vicinity will be sure to grasp this opportunity the minute he sees it. Are you the man of enterprise?

Inquiries will be given prompt attention and full information furnished. Don't put it off—it may be the very thing you have been waiting for.

THE SECURITY CULVERT CO., Minneapolis, Minn.

NEXT YEAR'S BUSINESS

Next year's business depends upon this year's foresight. Already hundreds of contractors are asking us for information about the POLK SYSTEM of silo, water tank, and grain storage construction. They have heard the CALL OF THE SILO. They know that silo building is the best paying business open to the American Contractor today.

A POLK SYSTEM SILO built this fall means ten POLK SYSTEM SILOS in the same community next summer. You cannot afford to waste a minute.

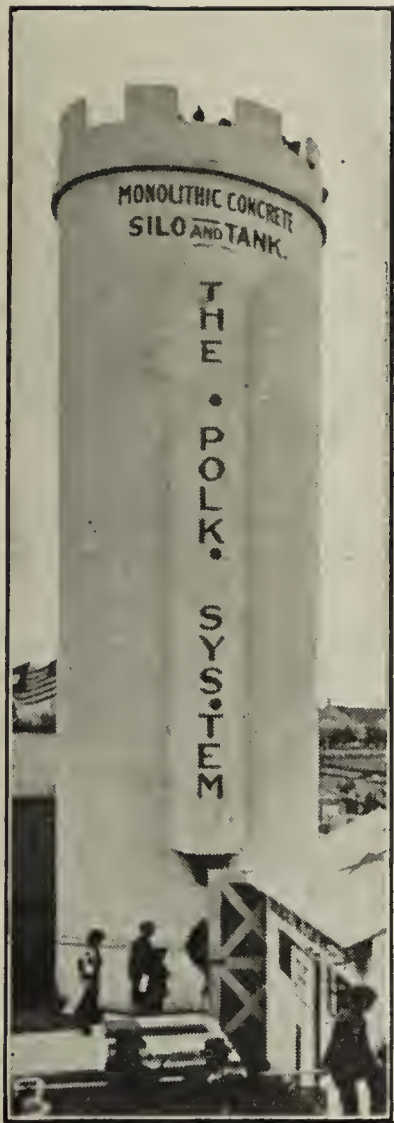
Write us today for information on the after-harvest silo proposition.

Just Send a Postal Card

Polk-Genung-Polk Co.

Fort Branch, Indiana

"It Renders the Service"



They are not built of pieces and they cannot go to pieces

A New Principle Invented in Cement Stave Silo Construction A Needed Improvement. Silos, Tanks, Etc., Built Any Size Desired

Mr. S. T. Playford, the originator of cement stave silos, has purchased an absolutely new type of silo. Those who have seen it—and who have made searching comparison with Mr. Playford's earlier efforts in cement stave silos, are united in saying that this invention creates a new standard by which silos must now be judged.

This new silo will be known as the S-T-P. The S-T-P Silo embodies the latest, up-to-date knowledge and experience in silo building. Being a new silo, we are not forced to cling to old ideas, patterns and machinery. We have in the most original manner produced a silo that is strikingly different—a silo of incomparable strength and matchless durability and efficiency. The S-T-P will enable you as a contractor to offer an A-No. 1 business proposition to the farmer. The

S-T-P Silo

"SILO THAT'S PERFECT"—Invented by W. A. Hillman

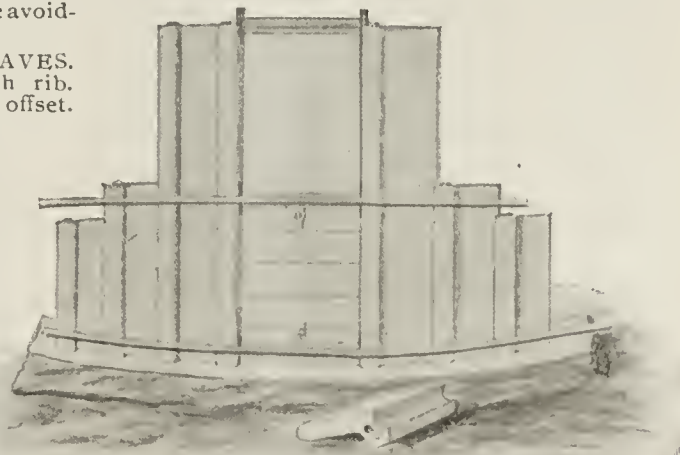
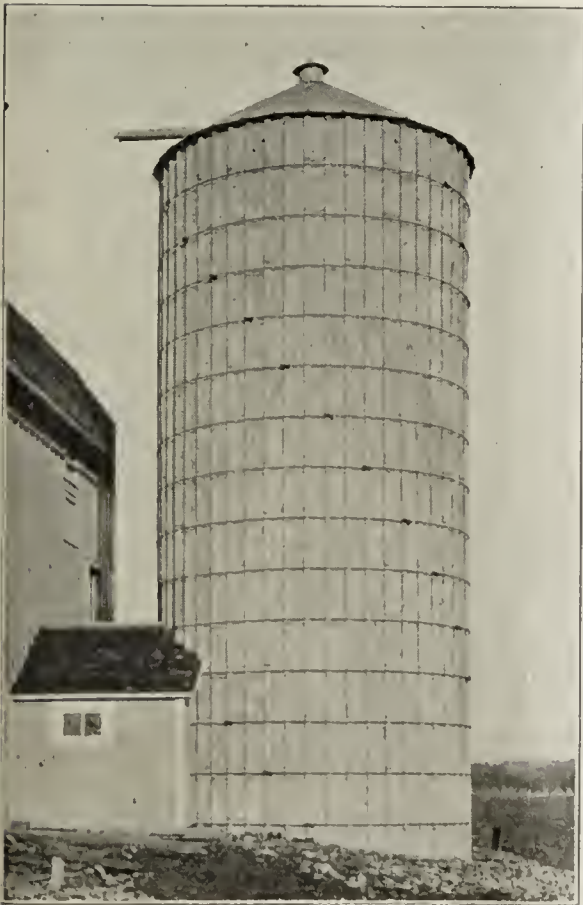
The more you know about silos, the more you will appreciate the S-T-P. The less you know about silos the more important it is that you learn about the "S-T-P." It means the avoidance of dissatisfaction and money losses.

The "S-T-P" is made of SLUSHED STAVES. Thoroughly reinforced. Has a 4½ inch rib. Pointed up on the outside. The hoops are offset. This to give a ladder to work upon.

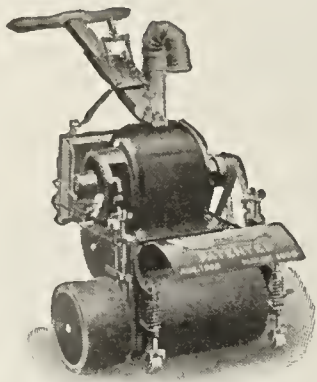
*Write for circular,
prices and further
information*

**PLAYFORD
MFG. CO.**

**298 Douglas Avenue
ELGIN, ILLINOIS**



TEST AND TRY BEFORE YOU BUY The Schluter Rapid Floor Surfacer



The Schluter BALL BEARING electric floor surfacing machines for mosaic, marble, composition and wood floors are the most simple constructed machines on the market. Direct chain drive AUTOMATIC DUST COLLECTORS. No gears or clutches to wear. Made in various styles.

OVER 5,000 IN. USE ALL OVER THE WORLD

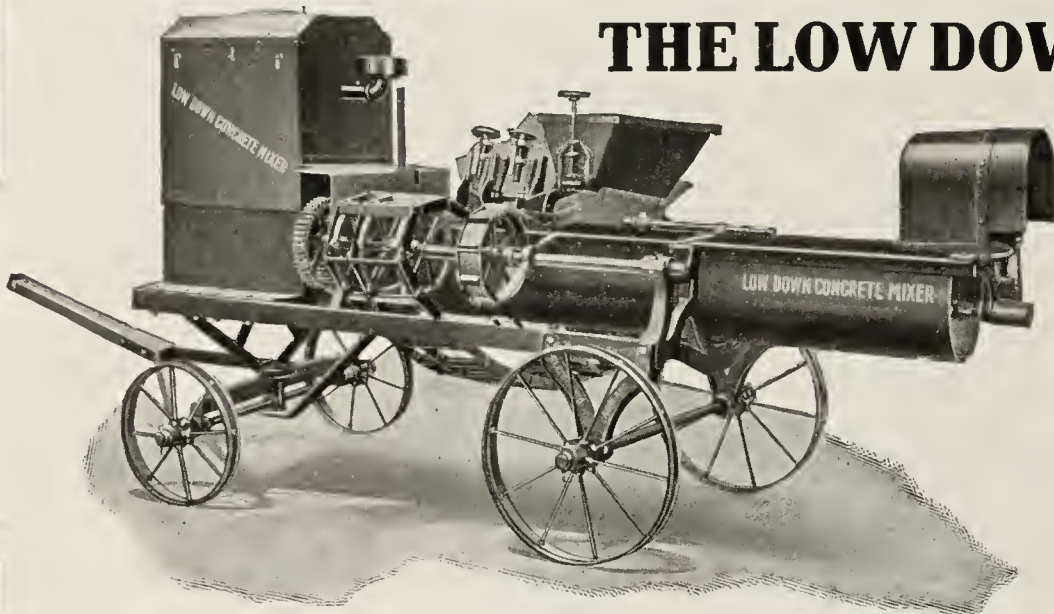
Send for prices and free trial proposition

THE M. L. SCHLUETER CO.

225 W. Illinois Street, CHICAGO



THE LOW DOWN FORCE FEED MIXER

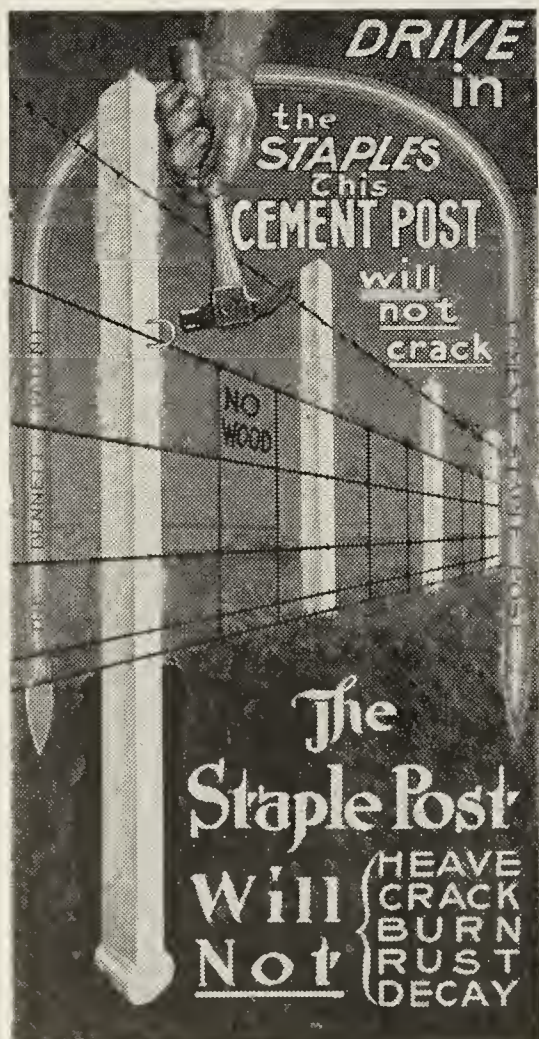


has a capacity of from 4 to 12 cu. yards an hour with a forced feed and stroke off measurement different from all others. It gives absolutely perfect proportions whether the materials are wet or dry. Cannot clog. You can set and lock the feed gates so there will be no variation.

Few parts, open-to-view mechanism and low down hoppers make this mixer economical in operation and upkeep. Feed can be changed without stopping the machine. Safety friction clutch enables you to stop or start the machine without stopping the engine. Construction perfect. Price remarkably low.

Find out more of the Low Down's good features. Send for Catalog "B," which gives detailed information. Mention Cement & Engineering News when writing.

ELITE MFG. CO., Ashland, Ohio



Staple Post Mold Co.

454 W. Home St., WESTERVILLE, OHIO

An Everlasting Cement Post

INTO WHICH

Staples Are Driven

The same as into wood. In use since 1906 and absolutely practical

The Staples Hold

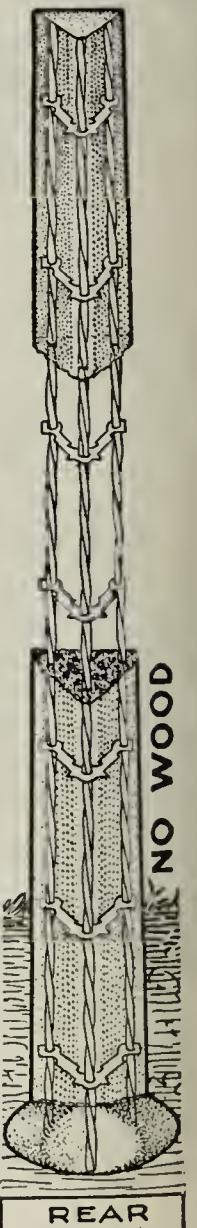
SEE THE REINFORCEMENTS

Strongest known to Engineers—Not a single complaint of posts breaking off at ground line—Lightest, strongest, easiest to make—compete with wood posts in many places.

MAKE STAPLE POSTS

A splendid opportunity for men of business and capital

Investigate and be convinced





MEDUSA WHITE PORTLAND CEMENT

USED FOR EXTERIOR FINISH OF
ST. FRANCIS WOOD GATEWAY, SAN FRANCISCO

MEDUSA White is an indispensable material for permanency, beauty and elegance in stucco, building ornamentation, concrete building blocks, interior decoration, statuary, cemetery work, setting marble, etc., and its artistic possibilities are unlimited. It is to be used in the same manner as ordinary Portland cement from which it differs in no respect except in its pure white color.

GIVE MEDUSA WHITE A TRIAL AND BE CONVINCED OF ITS SUPERIORITY

Dont fail to write for our new booklet
of illustrations and testimonials

SANDUSKY PORTLAND CEMENT CO.
CLEVELAND, OHIO



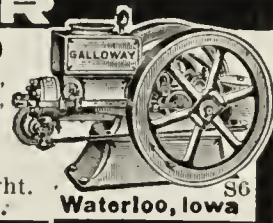
FRENCH'S PORTLAND CEMENT

Samuel H. French & Co.
PHILADELPHIA

Established 1844

RELIABLE POWER FOR CONTRACTORS AND BUILDERS

To pump, saw, excavate, hoist, irrigate, run mixers, elevators and all heavy machinery. Can be had in Galloway engines from 1 1-2 to 16 h. p. All styles. 200,000 customers testify to quality. Prices 1/8 to 1/2 what's usually asked. Low freight.

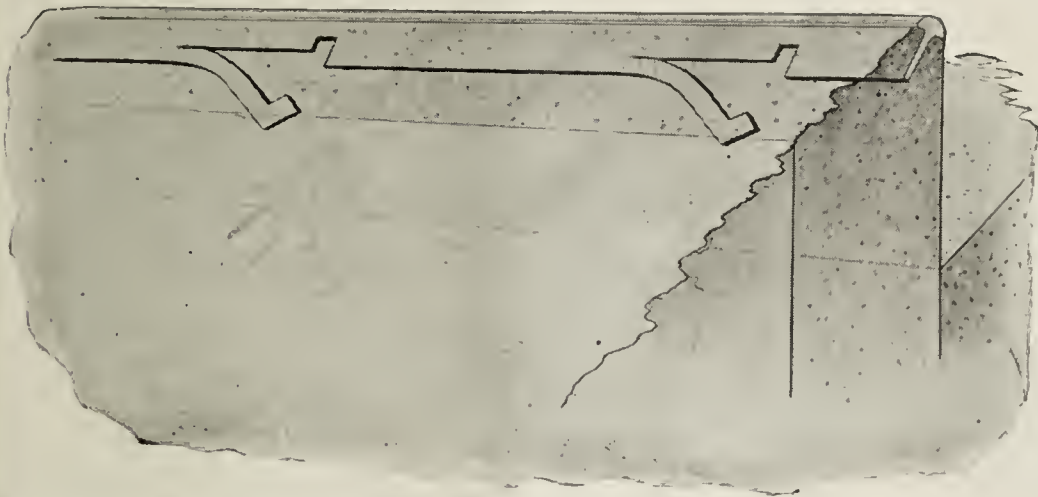


WM. GALLOWAY CO.,

Box E.

Waterloo, Iowa

ANY EDGE PROTECTOR



which anchors itself only to the very corner it protects, certainly defeats its own purpose.

The anchors of our hook bar are parts of the bar and extend deep into the body of the concrete, thereby fastening the curbing in a most positive and powerful manner.

AGENTS WANTED

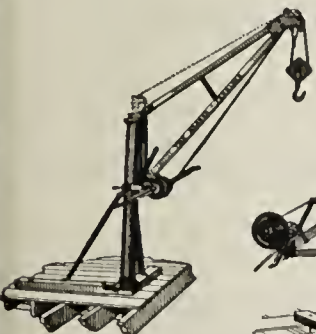
F. WILLIAM STOCKER, Inc.

Engineers

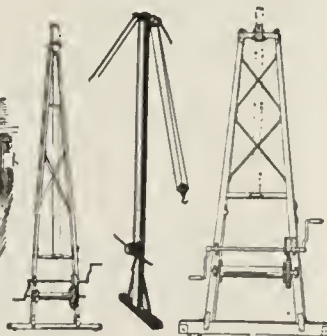
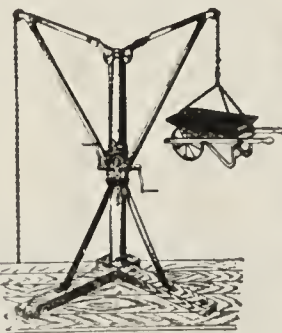
1031-1033 Clinton St.

HOBOKEN, N. J.

MOST COMPLETE LINE OF BUILDERS' DERRICKS



STIFF
LEGGED
DERRICK



Sasgen's is the oldest derrick house in the country. We make the strongest, best and most reasonable price derricks.

SASGEN DERRICK COMPANY,

We manufacture Steel and Wood Circle Swing Builders' Derricks, hand and power, Pole Setter, "A" Frame, Double Boom Wheelbarrows, Stiff Legged and Guy Line Derricks, Single and Double Drum Geared Winches, Blocks, etc.

2052 North Racine Avenue, CHICAGO

WRITE FOR CATALOG No. 15

Compactness and Sturdiness Mean Greater Efficiency



The "Excelsior"

was designed and built to set a fast pace for the higher priced mixers and contractors say it does. Equipped with low hopper; friction clutch; dust proof bearings; 3 H. P. engine. Can be equipped with hoist at small additional cost. Capacity $4\frac{1}{2}$ feet mixed material per batch; easily 65 cu. yds. per day. Write for illustrated catalog and judge for yourself the extra value of the EXCELSIOR.

Good territory open for agents

Excelsior Mixer & Machinery Co.
606 Merrill Bldg. Milwaukee, Wis.

AGENTS: Universal Steel Products Co., Chicago, Ill. L. & D. P. Smith, Valdosta, Ga. Loyal Power Co., Omaha, Neb. Manufacturers Supply Co., Minneapolis, Minn. Ward Equipment Co., Pittsburgh, Pa. E. W. Ripley, Farmington, Me.

Permanent Culvert at Minimum Cost



HALL INTERLOCKING CONCRETE CULVERTS

provide *permanent drainage* for roads and highways. Built in interlocking reinforced sections where *careful inspection* may be given the work. Can be installed quickly by *unskilled workmen*. Interlocking feature insures unity and prevents waste of material. No rust, corrosion or breakage.

Easy to manufacture, 5 sections cast at once. A profitable culvert from every standpoint. Collapsible forms for Hall Interlocking Culverts should be a part of every contractor's equipment. Low in price. Last forever. Write for full particulars.

SCHULZ & HODGSON
EASTERN DISTRIBUTORS
948 Association Bldg. CHICAGO



No. 5 BLASTING MACHINE

FOR SAFETY'S SAKE
USE THIS NEW



BLASTING MACHINE

ELECTRICAL blasting is being adopted more extensively since the perfecting of apparatus and methods. The using of electrical current provides a more positive stronger, efficient means of detonation than caps and fuse.

Electrical blasting enables the operator to determine the proper time for detonation to insure safety to all employees.

Electrical blasting eliminates hang fires, increases the efficiency of explosives and makes possible the firing of several shots at one operation.

For safety's sake, insist on your blasters using electrical blasting machines.

FOR SPECIAL INFORMATION ABOUT
ELECTRICAL BLASTING WRITE TO
DEPT. 112

DU PONT POWDER CO.

Established 1802

**WILMINGTON
DELAWARE**

The Trend of Architectural Expression

You have noticed the broad use architects are making of concrete in garden, home, garage, warehouse and factory.

For decoration it offers a wide variety of surface colors and textures which may be combined economically with concrete structural members. It conducts heat slowly, deadens sound, is moderate in first cost and in upkeep. It is fire resistive, making insurance rates low.

These are a few of the reasons why architects are using concrete for factories and warehouses where stability and permanence are essential; for hotel and office buildings where freedom from noise and ease of cleaning are of importance second only to reasonable cost; for residences where plain and treated concrete surfaces permit great leeway in architectural expression.

Write for a copy of our 223-page book "Factories and Warehouses of Concrete" or for a cloth bound illustrated copy of "The Concrete House and Its Construction."



The Administration Building, Washington Park, Chicago, furnishes an interesting example of the decorative and structural possibilities of concrete

UNIVERSAL Portland Cement Co.

— OFFICES: —

CHICAGO	208 South La Salle Street
PITTSBURGH	Frick Building
MINNEAPOLIS	Security Building
DULUTH	Wolvin Building

12,000,000 Barrels
Annually

Plants at Chicago
and Pittsburgh

CONCRETE FOR PERMANENCE



SIDEWALK FORMS CURB AND GUTTER FORMS

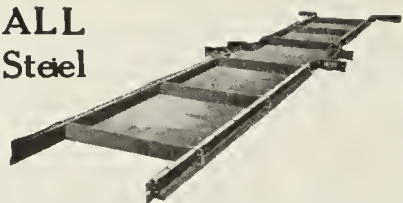
The contractor who bids on sidewalks, curbs, curb and gutters with the idea of using wooden forms is generally bidding under a definite handicap and will always do the work with less profit than he could with steel forms.

HELTZEL steel forms represent the very latest designs and their use means better work and better profits. Spread over the work of a season or two they mean a lower form cost per running foot of sidewalk than the use of wood forms. They are easily assembled. Work is fine, accurate and even. Write today for Free Catalog.

Heltzel Steel Form & Iron Works
Niles Road, Warren, Ohio

ZEISER FORMS

ALL
Steel



Sidewalk Curb, Curb and Gutter

*Sold Direct to Users
All Over the World*

Over a thousand satisfied users
will tell you what they are worth.

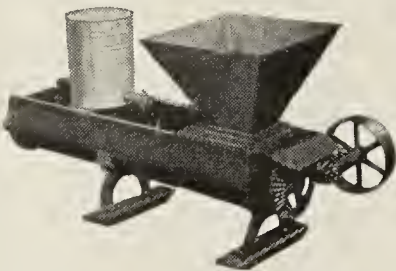
Write for the Contractors' Book

ZEISER BROS.

5318 E. 8th St., BERWICK, PA.



ONLY \$26.00 FOR X-L All Continuous BATCH MIXER



We make the largest line of small Batch and Continuous Mixers on the market. Whether you are a Cement Block, Brick, Tile Manufacturer or a Contractor, or whether you have a mixer, you should send for our literature as we make a specialty of manufacturing concrete mixers for different lines of work.

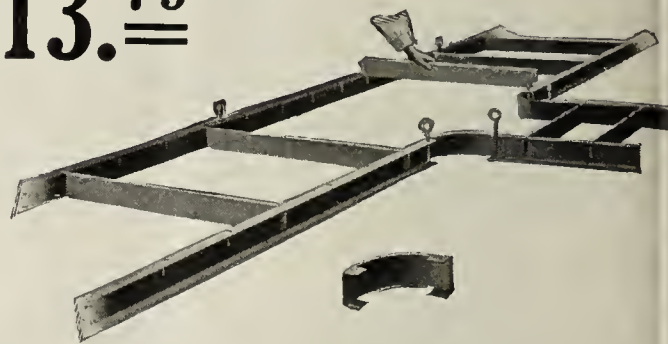
The chances are that it might pay you to discard your old mixer after you see the X-L All Special and we know it will pay you to investigate if you have use for a concrete mixer.

Burrell Manufacturing & Supply House
KANKAKEE, ILL.

There's Sense in Steel

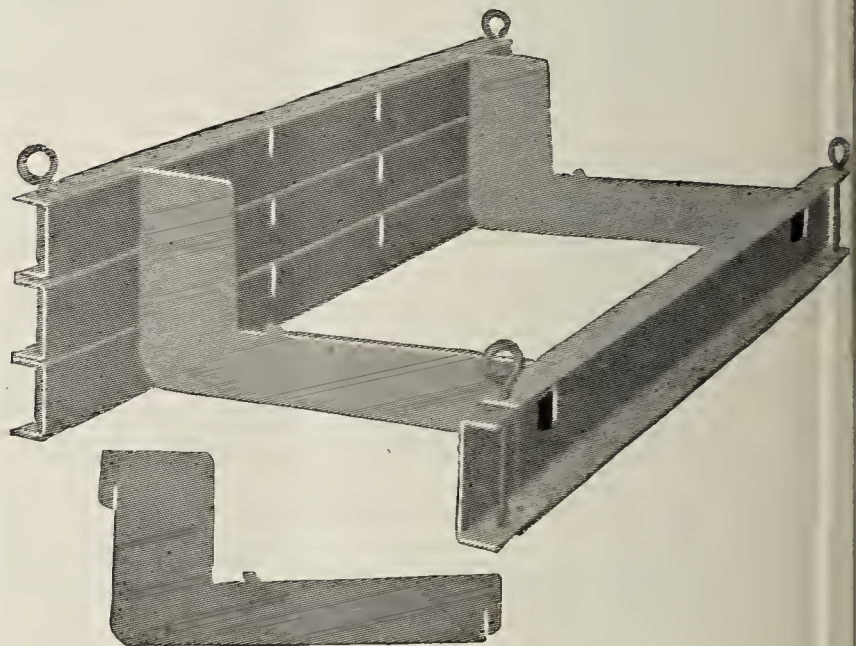
just as well as there are cents in the use of
Indiana Steel Forms.

For **\$13.⁷⁵**



you can buy enough Indiana Steel Side-
walk Forms to lay 78 running feet of
walk 4' or 5' wide per day.

The sense of buying these particular **steel** forms for
your work lies in the fact that the same forms can
also be used for curb and gutter construction by simply
adding the curb and gutter steel dividing plate.



Steel Forms mean permanent equipment.
That's why many of the largest and smallest con-
tractors are using **steel** forms in place of wood.

Steel means smooth, clean work. Indiana Steel
Forms are simple in construction. No wedges, pins,
ratchets, bolts or nuts to bother with. You will see the
advantage of them after a try out.



You Can't Overlook the Above Offer

It is limited, so better write for more particulars right
now. Surely you cannot afford to putter along with
wood forms when you can buy **steel** forms at this price.

Write for Our Literature

Indiana Concrete Mold Co.

216 East River St.,

Peru, Indiana

Investigation and Experience Are Proving the Reliability of Hydrated Lime for Waterproofing

Concrete Work. Architects, Engineers and Contractors everywhere are being interested in and are investigating the worth of Hydrated Lime as a waterproofing. Experience and actual application are proving to them beyond shadow of doubt that **HYDRATED LIME** is reliable, permanent and harmless.

It is usually employed in proportions of about 10 parts of lime to 90 parts of cement, or 10% of the cement is replaced with the lime.

Hydrated Lime is an extremely fine material, being much finer than the finest Portland cement; hence the material fills the voids in the concrete mass, making a denser and therefore more nearly waterproof substance.

THE reinforced concrete standpipe at Westerly, R. I., and illustrated herewith, was waterproofed with Hydrated Lime. The contractor says, "As the tower is to be made watertight simply by the density of the concrete, great care is being exercised in the choice of aggregate and cement and in the methods of mixing and placing. Frequent and accurate analyses are made to determine the voids in the sand and stone, so that the proper proportions of aggregate and cement to secure the maximum density of concrete may be used. About the average mixture by volume is one yard of stone to one yard of sand; 2-5-11 barrels of cement to one yard of concrete and about 5 per cent of hydrated lime.

Another large concrete tank has been successfully waterproofed with Hydrated Lime. The new 250,000 gal. reinforced concrete tank, 50 ft. in diameter, 16 ft. deep and with 8-in. thick walls, built by the R. L. Whipple Company, Worcester, Mass., for the artillery post at Ft. Strong, Boston Harbor, has been found to be absolutely water tight. Great care was exercised in proportioning and mixing the concrete. The mix was 1 cement to 4½ gravel, to which 5 per cent hydrated lime was added.

Hydrated Lime is shipped in 40 or 50 lb. paper bags, or 100 lb. burlap bags. It is a dry, unpalatable powder, which can be easily and safely stored.



Concrete Standpipe Waterproofed with Hydrated Lime

Full detailed information of the methods and cost of using this material may be secured from any of the following competing manufacturers of Hydrated Lime:

Saginaw Lime & Lumber Co., Saginaw, Alabama.	White Marble Lime Co., Manistique, Mich.	National Lime & Stone Co., Carey, Ohio.	Dittlinger Lime Co., New Braunfels, Tex.
Ohio & Western Lime Co., Huntington, Ind.	Dutchess County Lime Co., Dover Plains, N. Y.	John D. Owens & Son Co., Owens, Ohio.	Round Rock White Lime Co., Round Rock, Tex.
Security Cement & Lime Co., Hagerstown, Md.	Rockland & Rockport Lime Co., 101 Park Ave., New York, N. Y.	Woodville Lime & Cement Co., Toledo, Ohio.	Riverton Lime Co., Riverton, Va.
Lee Lime Co., Lee, Mass.	The A. & C. Lime Co., Canton, Ohio.	Rapid City Gypsum, Lime & P. C. Co., Rapid City, S. D.	International Lime Co., Sumas, Wash.
Charlevoix Rock Product Co., Charlevoix, Mich.	Kelley Island Lime & Transport Co., Cleveland, Ohio.	Gager Lime & Mfg. Co., Chattanooga, Tenn.	Standard Lime & Stone Co., Fond du Lac, Wis.

Advertising Man — Young newspaper man, formerly cement chemist, would like position in advertising department of cement company. Six years' experience in manufacture and testing of cement through the Middle West. Two years in newspaper work. Address H. A., c/o Cement & Eng. News, Chicago.

WANTED

Position as Chief Engineer, Master Mechanic or Superintendent in the Cement Manufacturing business, by a practical man in that line. Address, Chas. F. Nolen, Box 13, Alsen, N. Y.

WANTED

Superintendent for cement plant in engineer and experienced. State particulars and salary expected. Address C. O., c/o Cement & Eng. News, Transportation Bldg., Chicago, Ill.

SALES MANAGER.

A thoroughly trained and competent Sales Manager with 12 years of experience with a leading cement company is open to employment the first of November. Experience covers accounting, purchasing, credits and sales management. Highest class references. Address Sales Manager,

c/o Cement & Engineering News, Chicago.

FOR SALE.

\$650.00 Zagelmeyer Car System outfit for making slush blocks. First man with \$350.00 gets them. Address Humboldt Cement Products Mfg. Co., Humboldt, Iowa.

FOR SALE.

We can save you 25 to 50 dollars on a concrete mixer. High grade machines, fully guaranteed. Get our price before you buy. Superior Mfg. Co., 1405 Concrete Ave., Waterloo, Iowa.

HOTEL EMPIRE

Broadway at 63rd Street



NEW YORK CITY.

In the Very Centre of Everything.

Subway and Elevated R. R. Stations One Minute.

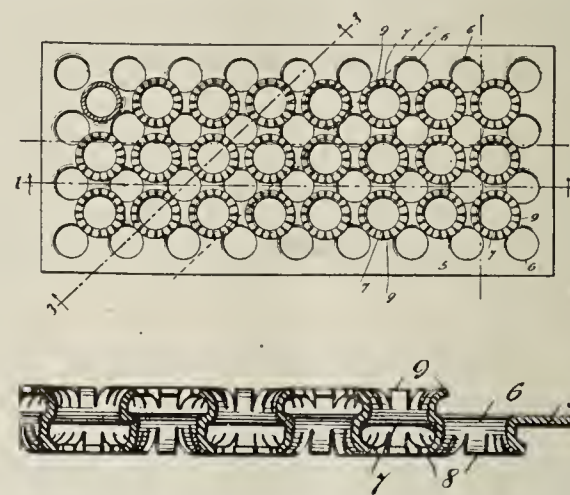
Five Minutes Walk to 40 Theatres and All the Famous Shops. All street cars and 5th Av. Motor Buses Pass our Door.

Coollest Rooms In Town Large Outside Rooms, use of Bath, 1 Person, \$1.00, 2 Persons, \$1.50. Large Outside Rooms, Private Bath, 1 Person, \$1.50, 2 Persons, \$2.00. Parlor, Bedroom and Bath, 1 Person, \$2, 2 Persons, \$2.50.

Special Rates for Long and Short Periods. A Place Where Nice People Dine.

Your Visit to New York Is Not Complete Unless You Stop at the Famous Empire.

For Sale or Royalty, Patent No. 1, 102,122 The "Lateral Grip" Reinforcement (Concrete Construction)



In State or Territorial Sections, as desired. For printed particulars and full information apply to

Wm. Appleby
Napa, California
Canadian Patent No. 162,365

Concrete Plants, Contractors, Etc.

Secure our confidential processes, methods and formulas and make concrete marble granites, sanitary flooring, etc., and make money.

Write for details

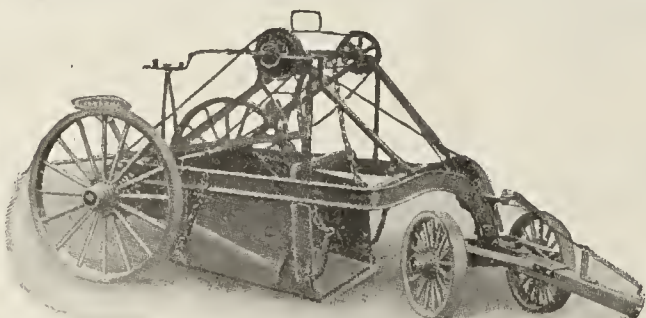
ART STONE CO.

Box 301

Waynesboro, Pa.

Cheap Subgrade Excavation!

THE MANEY FOUR WHEEL CUBIC YARD **SCRAPER**



"The Self-Loading Dump Wagon"

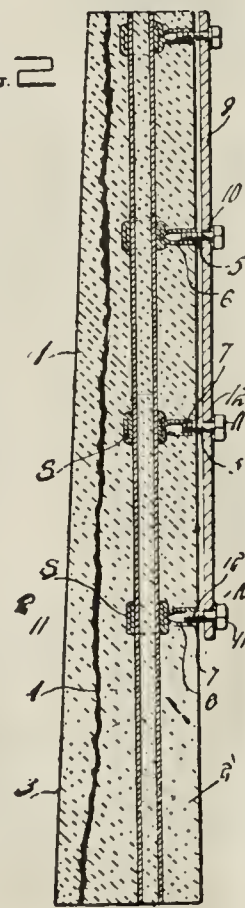
Gets Double the Output of Old Style Wheelers at little more expense. An outfit can move from 400 to 500 cubic yards in ten hours. Hundreds of paving contractors use Maney's. Write at once for catalog and prices.

The Baker Mfg. Co., 552 Stanford Ave., Springfield, Ill., U. S. A.

The Post that Will Not Rust, Rot, Break or Burn, but Gets Better Every Year

PATENT NO. 1,107,405

FIG 2



THE UNIVERSAL CEMENT POST

is the only cement post to which a plank fence may be attached without the use of a single nail. It is the only cement post which holds the fence in such a manner that it is impossible for cattle to ride it down, or hogs to go under it.

Further, it is the only cement post for building speedway and ball park enclosures; fastening of boards is an easy matter.

This post will not break at the ground. Our special process of reinforcing takes good care of that part. Can be made in any shape, design or length to match any design one may want to carry out.

The Universal Cement Post is the only all-feature post on the market. Large corporations want this post. A live state agent is wanted to take care of the demands for this post in each state and Canada.

My mutual plans will be profitable to all concerned. Write at once. Address all correspondence to

F. W. GOTTLIEB

General Agent

MORRISTOWN, INDIANA

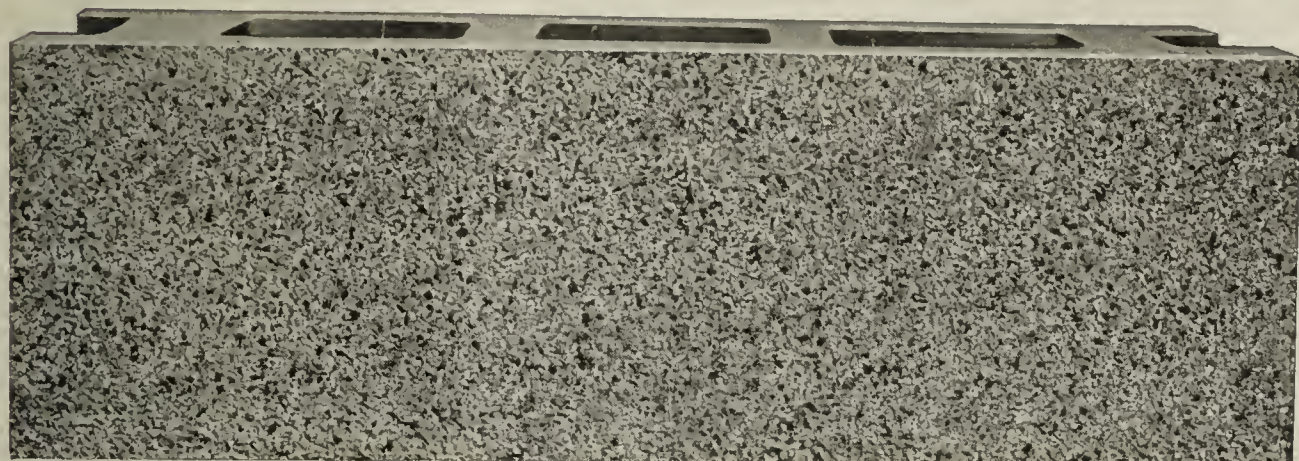
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ZAGELMEYER SYSTEM

OF CASTING

Hollow Cement Building Blocks

WITH GRANITE FACES



8x8x24 inch Granite Smooth Face Block

*They Cost Less
They Sell for More
You Sell More of Them*



Enlarged View of Granite Smooth Facing

BY A NEW process, which protects the facing, while the block is being cast, we eliminate all traces of cement from the face of block and nothing but the GENUINE GRANITE SHOWS IN ALL ITS SPARKLING BEAUTY.

These cuts show blocks just as they came from the molds, they are not treated with acid or scrubbed with brush, or sprayed.

We challenge the whole world to show us a cement block, made by any other system, at any cost, that equals these blocks for beauty, strength, quality or imperviousness to heat, cold or moisture.



8x8x24 inch Granite Rock Face Block

Send us fifty cents and we will send, freight prepaid, to any point in the United States, east of the Mississippi and north of the Ohio Rivers, a granite-faced block, one-half rock-faced and one-half plain-faced. **YOU WILL SAY WHEN YOU GET IT THAT YOU NEVER SAW A CEMENT BLOCK BEFORE.**

They are positively cheaper to make than the ordinary dry-tamp, sand faced block.

MR. BLOCK MAKER: What show will you have if your competitor secures the exclusive right for this system in your city?

ASK US ABOUT OUR MOLDS FOR MAKING SILO BLOCKS.

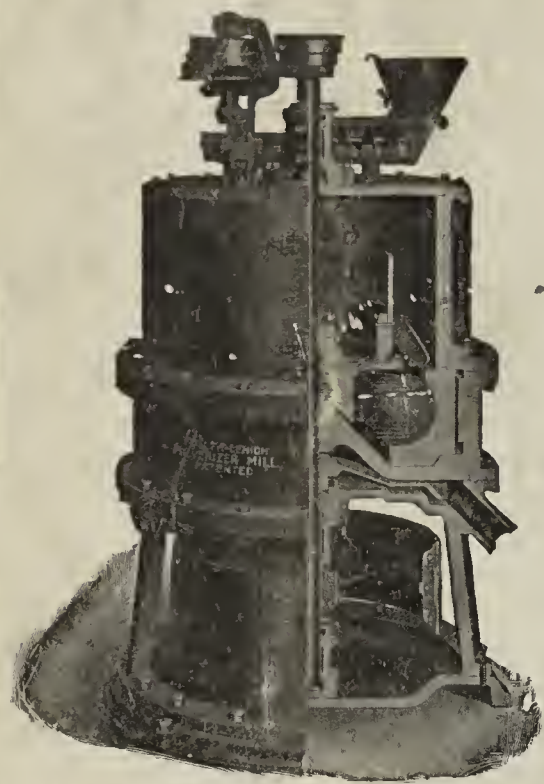
Send for a Catalog fully describing our system and showing our multiple molds mounted on trucks, for casting hollow cement building blocks.

Zagelmeyer Cast Stone Block Machinery Company

25 Crump Avenue

BAY CITY, MICHIGAN

The Fuller-Lehigh Pulverizer Mill.



Produces Commercially

Cement having a higher percentage of Impalpable Powder than can be obtained by any other mill. Tests show that the tensile strength of a 1-5 mortar made with cement pulverized by the Fuller Mill is higher than the tensile strength of a 1-3 mortar made with cement pulverized to the fineness required by the Standard Specifications.

Lehigh Car, Wheel & Axle Works

Main Office: Catasauqua, Pa.

New York
N. Y.

Hamburg
Germany

Cement Companies equipped with Fuller Mills advertise the fact that The consumer gets 38 pounds more of the Impalpable Powder or Real Cement in every barrel of cement produced by The Fuller Mill than by any other.



"OLD RELIABLE" "XX"—Our Motto is "QUALITY FIRST"

You may buy some cheaper grades of Shovel Chain than "XX" but our High Grade "XX" Chain is always cheaper in the end. Send for catalogue and prices.

Made only by **THE HAYDEN CORBETT CHAIN CO.,**

Columbus, Ohio

"OLD RELIABLE"
"XX" SHOVEL CHAIN

Some manufacturers make several grades of so-called Shovel Chain. We make one grade.

There's a Lansing Mixer for Every Job

For the painstaking contractor who takes pride in building first-class sidewalks, curbing and foundations, as well as the highly capitalized construction companies building speedways, skyscrapers and subways, which must be first-class—there is a Lansing

and They're Always on the Job

One contractor is operating 5 number 15 Lansing Mixers on the New York Municipal Railway, Sea Beach Line in Brooklyn—open cut with concrete retaining walls and the intersecting streets carried on concrete arches.

Instead of concentrating a few big mixers down in the cut and hoisting his concrete up—he keeps his five Lansings up on the street level and pours the concrete down.

The whole job is humming all the time.

So, on a small scale, do the smaller contractors register a saving through the use of Lansing Mixers.

Write for our new Catalogue—just out—No. 354

LANSING COMPANY

LANSING

MICHIGAN

OR ADDRESS OUR NEAREST WAREHOUSE

NEW YORK, 288-289 West St.
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PHILADELPHIA, Willow & No. American Sts.
SAN FRANCISCO, 338-48 Brannan St.

BOSTON, 78 Cambridge St.,
Charlestown, Dist.
KANSAS CITY, 1413-15 W. 10th St.
CHICAGO, 169 W. Lake St.

No. 5
LANSING



No. 7
LANSING



No. 10
LANSING



No. 12
LANSING



No. 15
LANSING



CEMENT AND ENGINEERING NEWS

Vol. 27

TRANSPORTATION BUILDING, CHICAGO, NOVEMBER, 1915

No. 11

F. L. SMIDTH & CO. ENGINEERS

50 CHURCH STREET

NEW YORK CITY

Designers, Equippers and Builders of
Portland-Cement-Making Factories



A $\frac{3}{4}$ " inside facing of Impervite mortar will waterproof any leaky cellar or pit.

Satisfaction guaranteed or money refunded.



receives **GOLD MEDAL**

After TESTING Impervite and all the other waterproofing compounds exhibited, the Judges at the San Francisco Exposition have just given Impervite the **HIGHEST AWARD** — the only compound so honored.

THE STANDARD PAINT CO.,

Woolworth Bldg., NEW YORK
Peoples Gas Bldg., CHICAGO
Beacon Building, - BOSTON

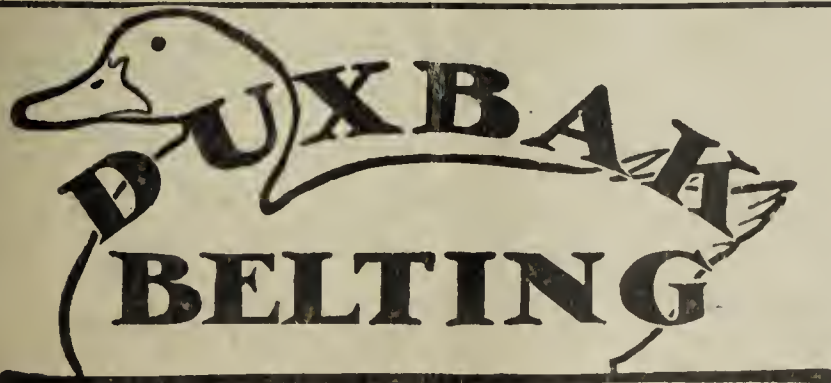
KRUPP

Grinding
Machinery

THOS. PROSSER & SON

24 Platt St., NEW YORK

Old Colony Bldg., CHICAGO



TRADE MARK

Awarded the Gold Medal of Honor at San Francisco Exposition.
Highest Award Given for Leather Belting Exhibits.

Chas. A. Schieren Company
ESTABLISHED 1868.

NEW YORK
30-38 Ferry St.
CHICAGO
128 W. Kinzie St.

PITTSBURGH
337 Second Ave.
DENVER
1752 Arapahoe St.

SEATTLE, 305 First Ave. South

The Texas Chas. A. Schieren Co., Inc., 106 S. Market St. Dallas, Texas

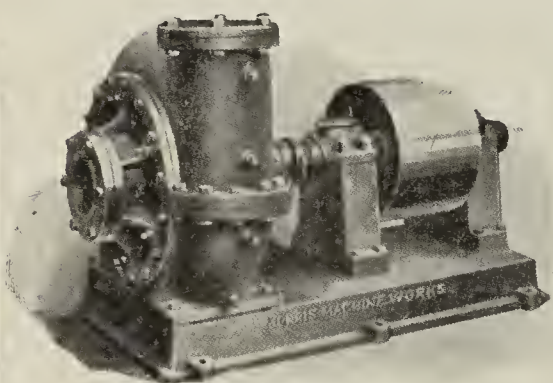
Tanners
Belt Makers

BOSTON
641-643 Atlantic Ave.
PHILADELPHIA
226 North 3rd St.

MORRIS

Solid Lined

Dredging Pumps



EVERYTHING that enters into the construction of the Morris Solid Lined Dredging Pump is of heavy proportions and the general design is such that wear is reduced to the smallest possible extent. Its ability to outlast other dredging pumps is its chief claim to economy.

By removing the upper half of the pump shell, the lining can be taken out or by removing the disc on the pump shell and the inner disc on the lining, the runner can be taken out. The pump is easily and quickly taken apart if necessary to replace lining or piston.

*Write for Sand and
Gravel Pump Catalog*

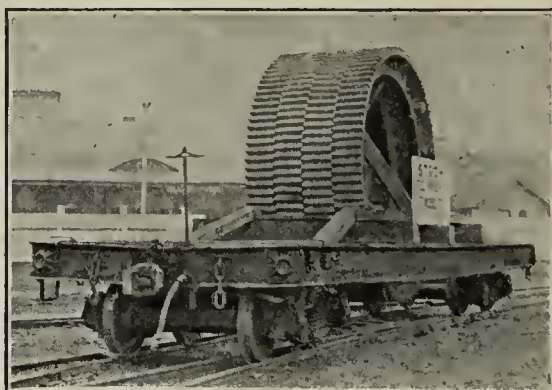
**Morris Machine
Works**

Baldwinsville, N. Y.

NEW YORK OFFICE, 39 Cortlandt Street

HENION & HUBBELL, General Agts.
227 No. Jefferson St., Chicago

Stroh Process



First shipment of gears for Universal-Portland Cement Company's plant of Duluth which is being equipped with Stroh Process Gears and Pinions.

Pinions and Gears

Grinding Plates

Crushing Plates

Track Wheels

Sprockets

Sheaves

Liners

Mantles

Concaves

WEAR-PROOF - LOW PRICED



Trade Mark
Registered



Fracture of
Involute Tooth

MADE EXCLUSIVELY BY

Kennedy-Stroh Corp.

PITTSBURGH, PA.

Complete Grinding

IN ONE

MACHINE

In successful use grinding
Cement, Clinker, Lime-
stone, Coal

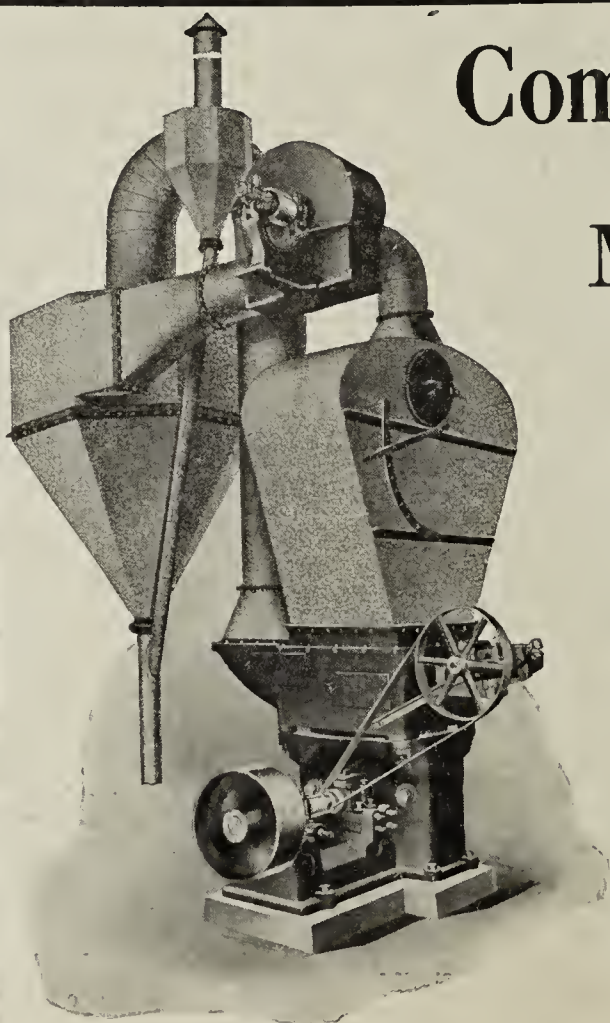
INSTANT REGULATION
OF FINENESS

NO DUST

Send for circular

THE BONNOT CO.

CANTON, OHIO



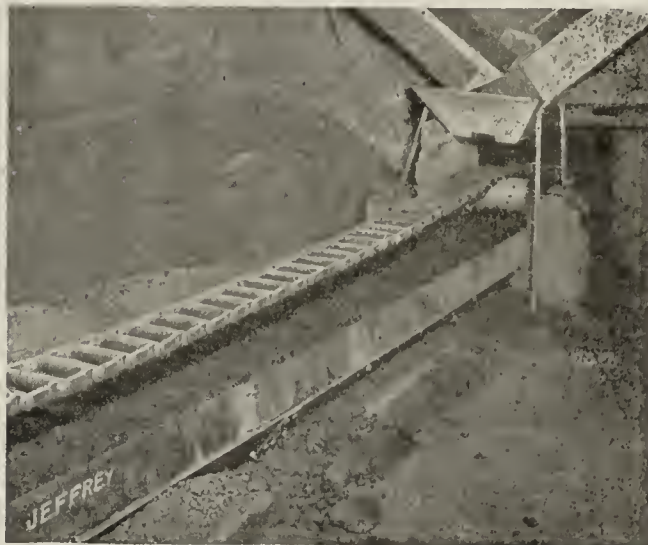


300,000 Barrels of Cement Clinker Handled by This Jeffrey Drag Chain Conveyor During the First Six Months of Operation



Conveyer under one of the kilns

This conveyer is installed at the plant of the Giant Portland Cement Co., Egypt, Pa. It is made up of No. 102 Jeffrey "Reliance" Drag Chain and operates in a steel trough—carrying the hot clinker from the kilns. It travels at the rate of 25 feet per minute and has a capacity of 100 barrels per hour.



Showing how readily accessible the chain is for inspection

Distinctive Features which Recommend this Type of Conveyer as the Most Economical and Efficient Equipment for handling Clinker, Ashes, Stone and other abrasive materials.

Economy. The drag chain itself is low priced, which means an exceptionally small cost for installation and maintenance.

Durability. It will stand more wear and tear than any other similar equipment. The long internal wearing surfaces of its steel pins and the external wearing flanges which come in direct contact with the material, insure long life to the conveyer. Actual wear on chain is greatly reduced because a film of finer material acts as a cushion or wearing surface between the chain and trough.

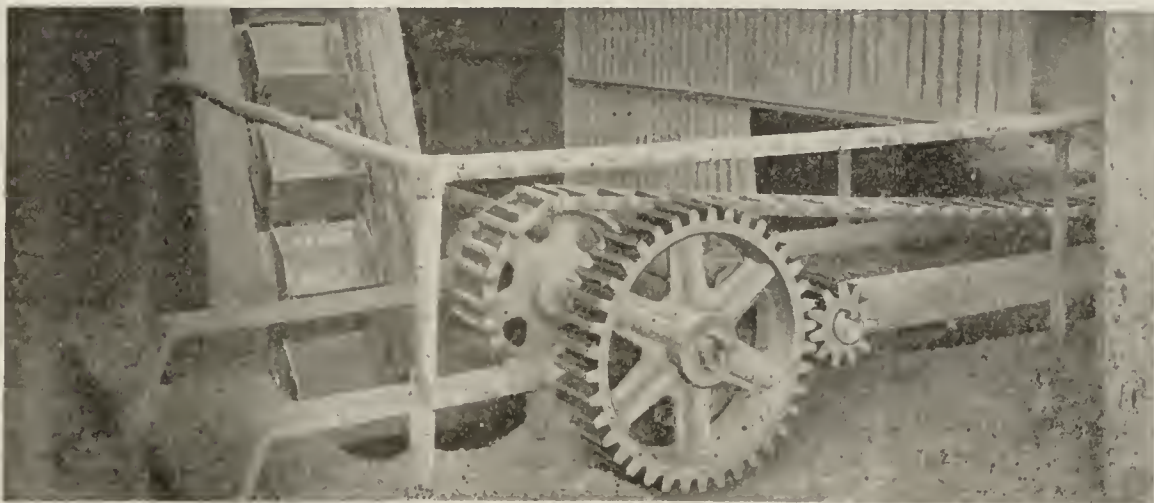
Simplicity. Only one sized chain required for all conveyers. Readily accessible for inspection. All conveyer parts, sprockets, chains, idlers, and bearings being interchangeable can be carried in stock, insuring continuous service. Conveyer occupies minimum space. Can be operated by one man.

Bulletin No. 161-14 tells more about the Jeffrey Reliance Drag Chain Conveyer and shows various applications in the handling of Cement Clinker, Stone, Ashes, etc. Write for copy.

JEFFREY MFG. CO., 914 North Fourth Street, Columbus, O.

New York Boston Philadelphia Pittsburgh Milwaukee Birmingham Chicago Denver Montreal

Another Jeffrey Reliance Drag Chain Conveyer which handles broken stone from raw storage in the plant of the Giant Portland Cement Co.



Conveyer delivering broken stone to Jeffrey Bucket Elevator which delivers to raw Griffin Mill bins.

Superior Jaw Crushers

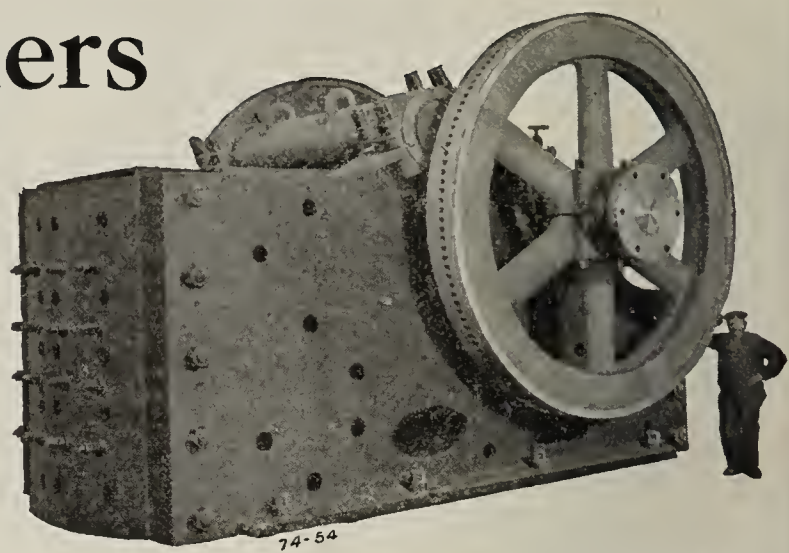
Particularly adapted for Cement Plants—For use in connection with Steam Shovels of largest size. Size of Feed Openings—36"x24"—42"x40"—60"x48"—84"x60". The advantages are—Large Feed Openings—Low Initial Cost—Low Cost of Maintenance—Low Power Consumption—Saving in Dynamite—Saving in Labor over hand loading, and above all **ABSOLUTELY RELIABLE**. One of our 84"x60" Superior Jaw Crushers crushing hard trap rock has been in operation for nearly five years without the replacement of a *single part*. Described in our Bulletin No. 44—108.

Power & Mining Machinery Co.

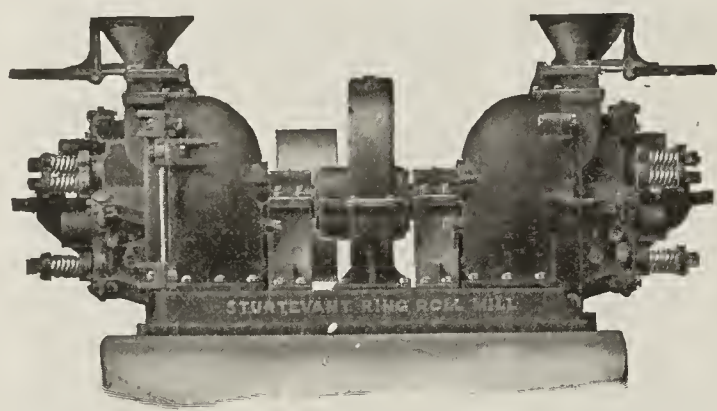
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New York Office: 115 Broadway

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M 315.2



STURTEVANT RING-ROLL MILL

For **CLINKER, LIMESTONE and COAL**
THE LARGEST PRELIMINARY GRINDER BUILT

CAPACITY PER HOUR ON CLINKER

80 TO 120 BBLs.	TO 20 MESH WITH	80 - 90 H. P.
50 " 80 " " 40 " "		80 - 90 H. P.
50 " 60 " " 80 " "		80 - 90 H. P.

UPKEEP APPROX. 10c. PER BBL.

The Ring-Roll Tube Mill Unit can produce cheaper cement from every standpoint — upkeep capacity, low power and continuous operation than any other. Ask the users, they can prove it to you, and we can.

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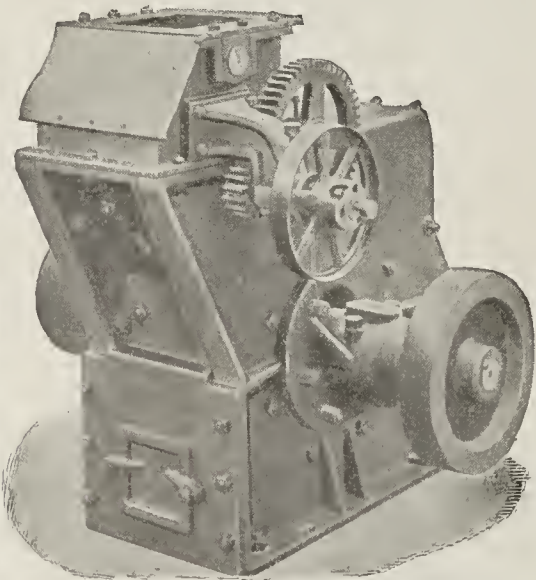
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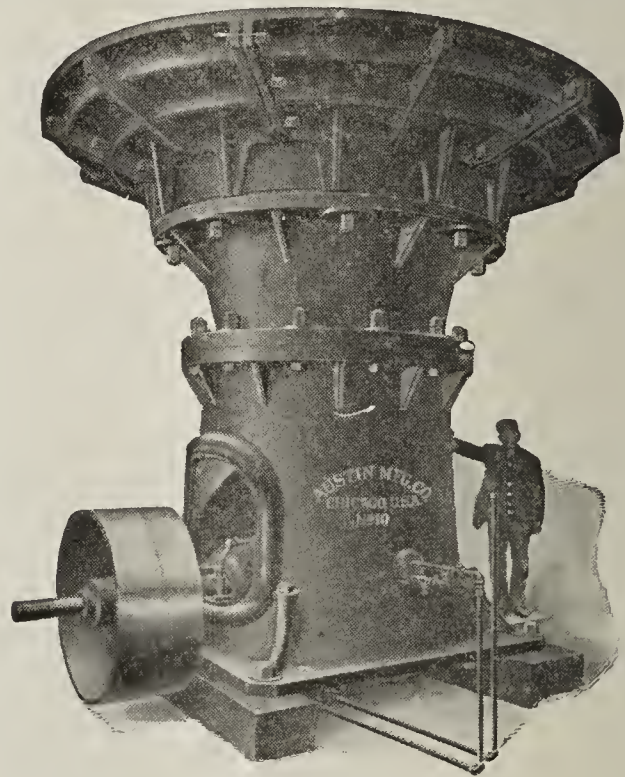
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The World's leading Ore and Rock Crusher. Its many superior qualities and mechanical advantages have won the highest reputation amongst Mining Engineers and Quarrymen.

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DOLESE & SHEPARD'S STONE CRUSHING PLANT AT NOVAK, ILLINOIS

All machinery throughout erected by us. The pan conveyors, crushing rolls, jaw crushers and shaking screens were manufactured by Power & Mining Machinery Co., and were also erected by us.

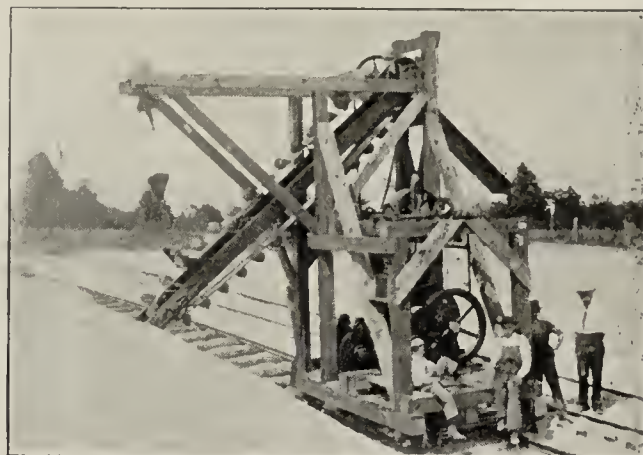
We build complete plants handling crushed stone, gravel, sand, coal, ashes, grain, flour, merchandise and packages

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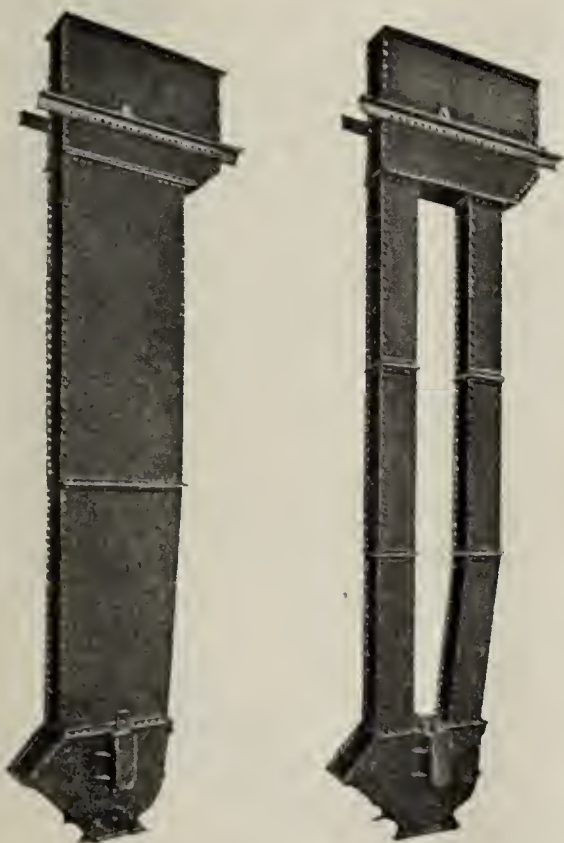
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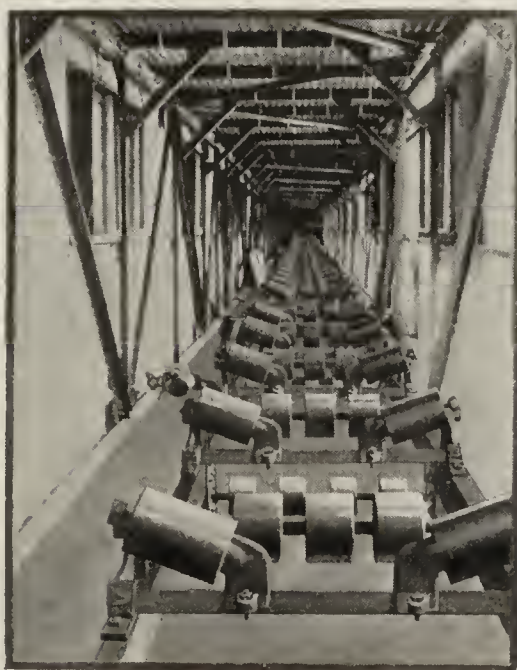
CHICAGO



Sand Loading Machine
Loading Direct from Bank
Into Car

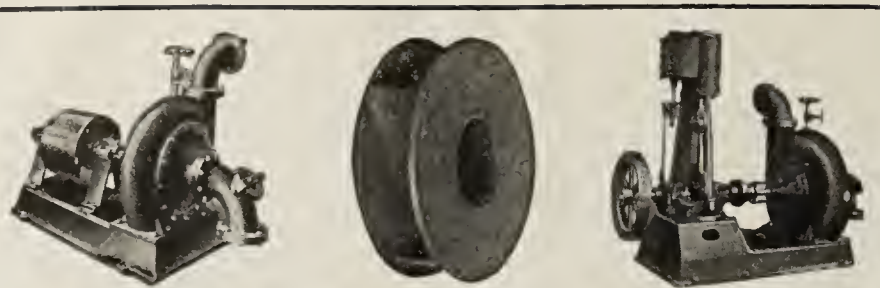


Steel Elevator Legs



Belt Conveyors and Spiral
Conveyors with Steel
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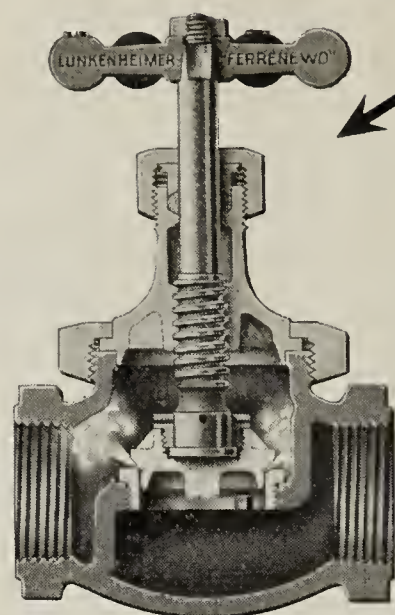
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are our specialty. We build a full line of Standard Pumps for the most common requirements as well as a complete line for High Heads, either Motor Driven or Engine Driven.

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Successors to the Erie Pump and Engine Works
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The Original

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Beware of
"Cast Iron Imitations"
Claimed to be "just as good" as the

**LUNKENHEIMER
"FERRENEWO"
VALVE**

"Cast Iron Imitations" are inferior!

The body of the GENUINE AND ORIGINAL "FERRENEWO" VALVE is made of a SPECIAL HIGH-TENSILE FERROUS MATERIAL formulated in our own laboratories particularly for this valve, and is far superior in strength and durability to the grades of Cast Iron used by imitators.

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Your local dealer can supply them. If not,—write us.

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Largest Manufacturers of
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"THE TWENTY-FIRST CENTURY BAG"

"VALVE BAGS"

THEY ARE THE BEST
FOR CEMENT, LIME,
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GROUND STONE, ETC.

SAVE MONEY AND TIME BY USING THEM

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The Strongest Paper Bag Made

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100
Years
Ahead of
All the Rest

\$1,000 Saved by using a Thomas Electric Hoist

AFTER THE FIRST YEAR'S
USE OF A THOMAS ELEC-
TRIC HOIST WE SAVED
\$1,000 IN OPERATING EX-
PENSES, IN THE ITEMS
OF FUEL AND LABOR
ALONE.

Here-
tofore we
used steam pow-
er and always had
expenses for broken parts,
boiler repairs, oil and waste,
grates, loss of time from shut-downs, etc.

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INDIANAPOLIS, IND. Feb. 9, 1914

Thomas Elevator Co.,

Chicago, Ill.

Gentlemen:

After our first year's use of one of your 50 H.P.
Electric Hoists, we feel it our duty to express to you our
appreciation of its worth. We are more than satisfied with
it, and know it is the best investment we ever made.

From calculations made at the close of our year's
business, we find we have saved more than \$1000.00 in operating
expenses in the items of fuel and labor alone, not including
boiler repairs, oil and waste, grates, broken parts and loss of
time from shut downs, which would run a few hundred dollars
more. Heretofore we used steam for power altogether and have
changed to electric since last February.

We have had no repairs whatever on our electric hoist
and have used less than \$2.00 worth of oil.

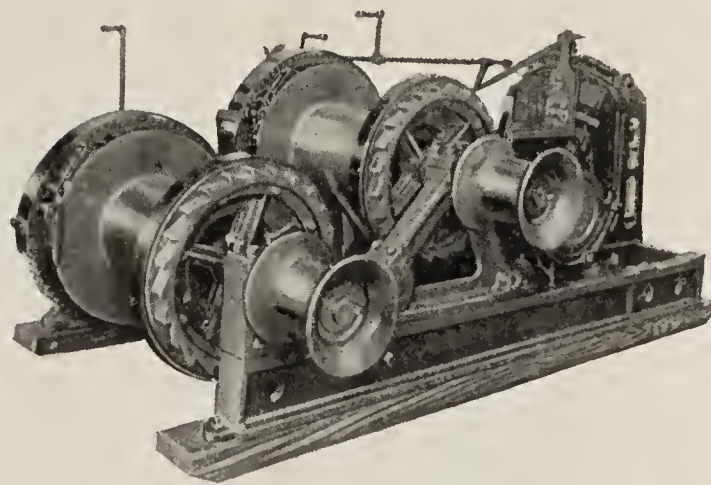
You may take the liberty to refer anyone to us.

Yours very truly

MAXWELL GRAVEL COMPANY

Per *Stewart W. Maxwell* Mgr.

Thomas Electric Hoists are
built to meet the require-
ments of speed, efficiency,
economical operation and
substantial construction
for all classes of work.



Before buying a hoist get our
catalogue

THOMAS ELEVATOR COMPANY

18 SOUTH HOYNE AVENUE
CHICAGO

JOIN THE ARMY OF SATISFIED USERS OF ELECTRIC FURNACE STEEL CASTINGS

It's a self evident fact that the purer a steel the better its properties.

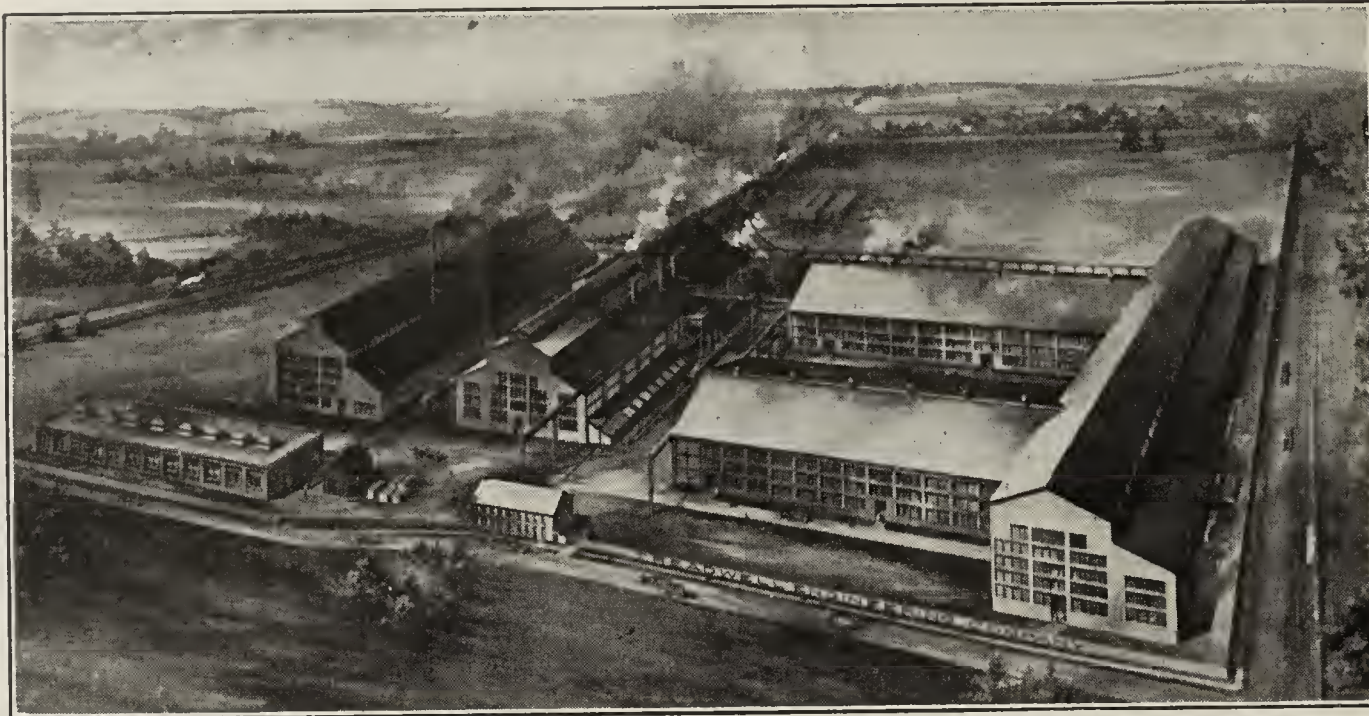
The *superior purity* of electric furnace steel is *unquestionable*. (See Iron Age, issue of April 23rd, 1914)

No oxides
No segregation

Low phosphorus
Low sulphur

High tensile strength
High elastic limit

Greatest resistance
to wear and fatigue



Castings of Special Analyses for Cement Mill Machinery

Give 50% to 100% additional
service

Grinding Rings, Liner Plates
Yokes, Pushers
Griffin Mill Parts, Etc., Etc., Etc.

Grey Iron Castings from
1 Lb. to 35 Tons

Grate bars for all styles of dryers

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Power Transmission
Machinery

Gear drives, rope drives, etc.

Stoeber Pipe Threading and
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Machinery Designed for
Special Purposes

TREADWELL ENGINEERING COMPANY, Easton, Pa., U. S. A.

RECORD

**of 48 in. Symons Disc Crusher
for a period of approximately 11 months**

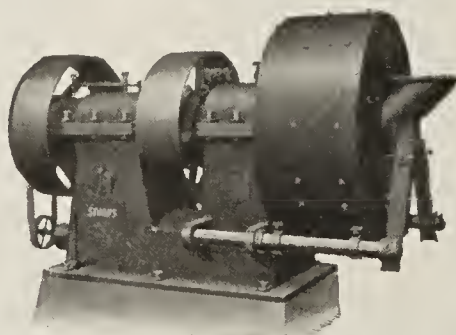
Operating labor	\$0.00214 per ton crushed
Repair labor	.00205 per ton crushed
Material for repairs	.00280 per ton crushed
Power	.00899 per ton crushed

Total	\$0.01598
Less extraordinary items	.00228

Cost under normal conditions... .01370

No. 1 Crusher ran 4,392 hours and crushed 197,640 tons of ore. One pair of discs ran 3,453 hours, crushing 155,385 tons at cost of \$0.0014 per ton for discs.

No. 3 Crusher ran 4,462.5 hours, and crushed 200,812.5 tons ore. One pair discs ran 4,462.5 hours, crushing 200,812.5 tons at cost of \$0.00109 per ton for discs.



Patented

Crushers handled 45 tons per hour, crushing 3 in. to $\frac{7}{8}$ in. and requiring 35 horsepower each.

Manufactured and sold only by
Chalmers & Williams
1457 Arnold Street
CHICAGO HEIGHTS, ILL.

CUT YOUR COAL BILL IN TWO!



ON A MURRAY POWER PLANT COMPLETE

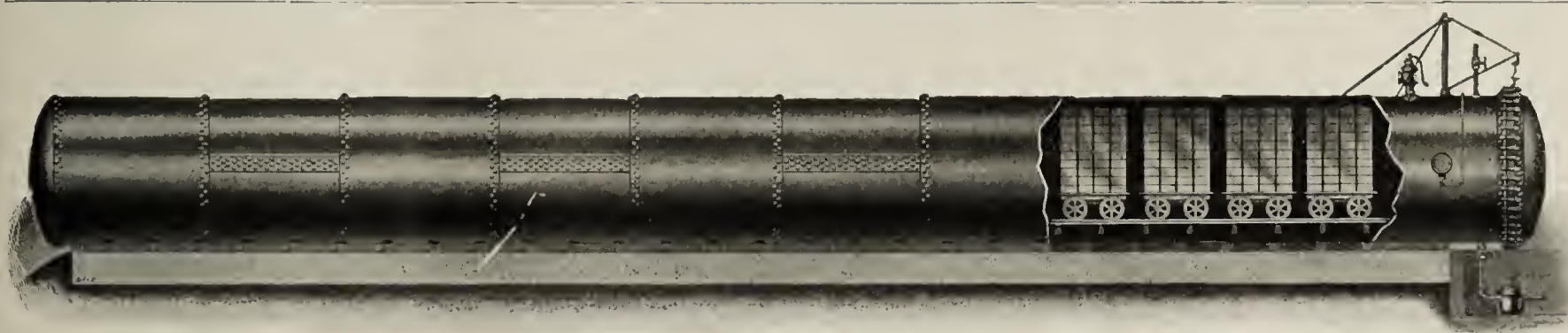
ASK MURRAY IRON WORKS CO., Burlington, Iowa, ABOUT IT.

Sand Lime Brick Machinery

Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

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SHEARER & MAYER DRAGLINE CABLEWAY EXCAVATOR

(PATENTED)



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Boulders and Gravel**



**Conveying and Elevating to
Screening Plant**

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If, by the use of one machine you could eliminate a complicated excavating and conveying system at your gravel plant, would you not be interested? Then study the above cuts. Note the absence of men in and about the pit and figure the saving in labor cost alone, to say nothing of the saving of fuel and maintenance cost, made possible by a well designed, substantially constructed dragline cableway excavator.

ONE MACHINE—ONE OPERATION—ONE MAN CONTROL

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Information Furnished Free.

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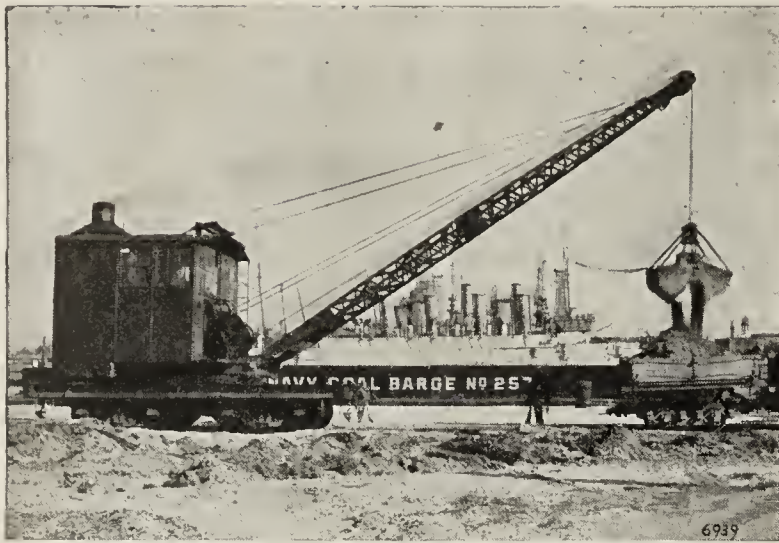


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and Screens**

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LINK-BELT LOCOMOTIVE CRANES

Equipped with Grab Bucket, Electric Lifting Magnet or Hook Block — The Most Efficient Crane on the Market To-day.



One of three standard Link-Belt Locomotive Cranes,
at the League Island Navy Yards, Philadelphia

DISTINCTIVE FEATURES

Steel Gears throughout.
Bronze Bushings throughout.
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Also Dipper Bails and Hinges

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are being used by the leading contractors and building material dealers throughout the country. They will show a profit on your work.

Let us submit actual figures applying to your present situation.



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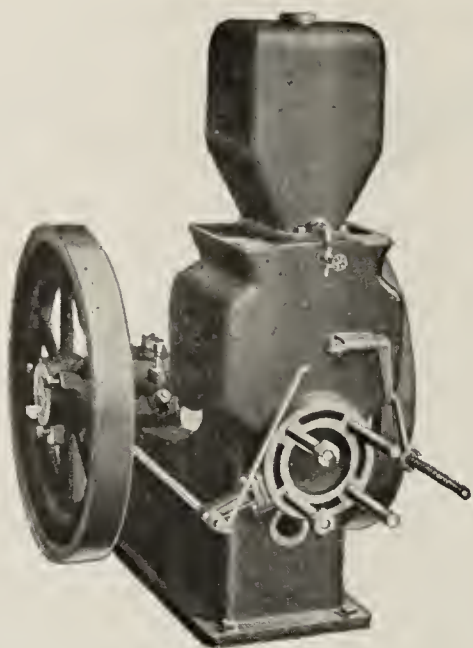
Why rent slow teams? Own your motor truck. By actual experience it has been shown that a 3½ ton truck equipped with 8 foot body, can do the work of five teams per day on road construction. **This saving in a year's time amounts to more than enough to pay for the truck.**

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Write today for detailed information and catalog.

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The Engine with the Troubles Left Out

(4 H. P. Type with Cylinder Head Removed)

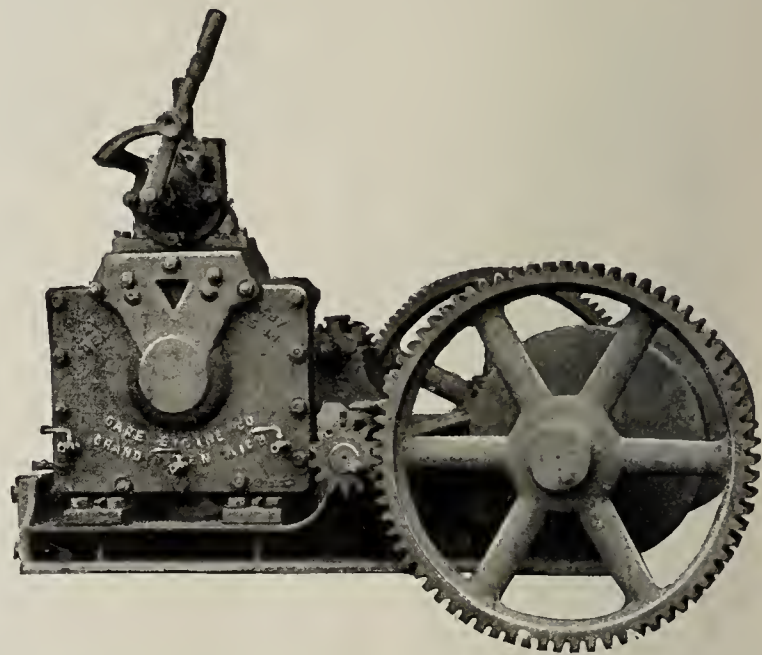
We are now prepared to offer you our latest type of KEROSENE ENGINES which have the distinctive features of starting directly on kerosene oil.

No Batteries No Carburetors No Hot Tubes
No Magnetos No Torches No Hot Balls
No Troubles

Users and owners should know about this efficient and fuel-saving engine. Your correspondence is solicited.

The A. M. Castle Engineering Co., Inc.
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The compactness and simplicity of operation bring the
DAKE SWINGING ENGINES
in great favor with progressive contractors.



One of the largest construction firms in the United States has EIGHTY of our DAKE Swinging Engines in use. Many years of service have proven the durability and efficiency of these machines. It will pay you to investigate.

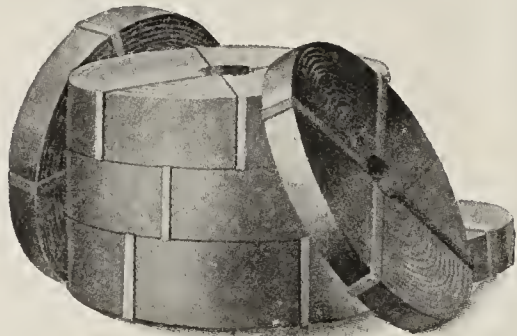
Write for catalog of our contractors' hoists, swinging engines, motor crabs, spud hoists, etc.

Dake Engine Co., Grand Haven, Mich., U. S. A.

Agents:

Boston—H. L. Bond Co. **New York**—H. L. Drullard, 30 Church St.
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A Genuine Bargain in Balata Belting



80 to 100 Per Cent Saving for You

CONSTRUCTION—This BALATA BELTING is made of very heavy, closely woven, high-grade duck, treated, impregnated and coated with Balata gum. It is pliable, has great durability, and strength, and will transmit more power than any other belt of its kind.

COMPARISON—This class of belting generally sells for almost the same price as Leather Belting and is its superior for some uses, on account of being waterproof and having very little stretch.

WHY THE PRICE?—Some manufacturers of Balata Belting coat one side (the one opposite the pulley) with gum for distinctiveness and looks. This belting offered is coated on one side and this coating may or may not come off, this in no way affecting the power transmitting qualities of this belt. See our GUARANTEE.

OUR GUARANTEE

We absolutely guarantee every piece of this belting, and if it should prove defective in workmanship or material, as entered into its construction, otherwise than stated, may be returned, and your money cheerfully refunded. We will also send it subject to your inspection, and if found otherwise than we state may be returned at our expense.

Mention Lot No. C-12

Amount on Hand	Size Inches	Our Price per Foot	Regular Selling Price	Amount on Hand	Size Inches	Our Price per Foot	Regular Selling Price
1170'	1" —3-ply	\$0.03	\$0.06	567'	7" —5-ply	\$0.42	\$0.76
485'	1¼" —3-ply	.03	.08	1029'	8" —5-ply	.48	.86
3167'	1½" —3-ply	.04	.10	1414'	8" —6-ply	.58	1.03
1602'	1¾" —3-ply	.04	.11	771'	10" —5-ply	.60	1.08
1112'	2" —3-ply	.05	.13	3280'	10" —6-ply	.71	1.30
568'	2½" —3-ply	.06	.16	745'	12" —5-ply	.71	1.30
1167'	2¾" —3-ply	.06	.18	1515'	12" —6-ply	.86	1.55
967'	3½" —3-ply	.10	.23	364'	16" —6-ply	1.18	2.07
575'	4½" —3-ply	.12	.29	480'	18" —6-ply	1.33	2.34

In ordering be sure to mention Lot No. C-12 to obtain these prices.

We will cheerfully send samples on request to those who desire them. (State size of belt wanted.)

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General Mill Furnishers

Incorporated in 1901

CHICAGO, ILL.



Supremo Conveyor Belt

Adapted for all general requirements such as conveying gravel, cement, clinkers, crushed stone, grain, clay, wood-pulp, salt, tailings, etc. It is far above the so-called standard belt, and one that has given general satisfaction under more than ordinary conditions.

There is a diversified list of uses for Conveyor Belting. We have carefully studied the different conditions and materials and stand ready to construct a belt for the duty to be imposed, which is often of an abusive character. Conveyors for hot cement, hot coke or slag, crushed stone, silica sand, etc., represent a few of the extreme cases.

MANUFACTURED BY

Revere Rubber Company
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HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs—no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our No. 38 Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

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17th Street and Western Ave., CHICAGO

NEW YORK, Fulton Bldg., Hudson Terminal, 50 Church St.

Henry Heil Chemical Company

210 to 214 South Fourth Street, ST. LOUIS, MO.

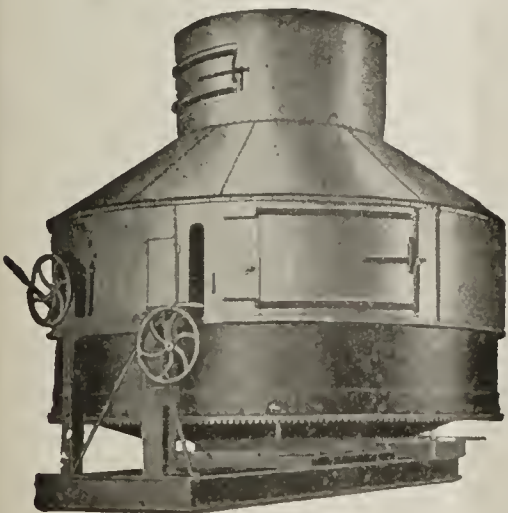
We make a specialty of
supplying cement works with

Chemical Apparatus, Chemicals and Reagents

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Schumann's, LeChatelier's and Jackson's
Specific Gravity Apparatus, Etc.

Pyrometers, Calorimeters
High Grade Goods Only

Write for our Large Illustrated Catalogue



Clyde Hydrator with Hood
"The Common Sense Way"

SIMPLICITY IS THE KEYNOTE OF SUCCESS

IT does not take a "master mind" to install a CLYDE Hydrating plant, nor does it take a "high priced" engineer to run one. If **YOU**, Mr. Lime Manufacturer, realized how simple it is to obtain a PERFECT HYDRATE, with the CLYDE HYDRATOR you would place your order with us by FIRST MAIL. Write us today—NOW, and let us explain to you what CLYDE PROCESS hydrated lime is and how to obtain the best results, then

Use your own judgment—it's up to you

H. MISCAMPBELL - Duluth, Minn.

Patentee and Sole Manufacturer

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Designing, Constructing and Operating Engineers

Cement and Hydrated Lime Plants a Specialty

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INCORPORATED

ENGINEERING, DESIGNING AND CONSTRUCTING

Remodeling and Operation of
Portland Cement Plants a Specialty

**RIALTO BUILDING,
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Fuller Face Hardened Sprocket and Traction Wheels

Unequaled for severe duty. Proven by test. Their use prolongs the life of chain.

RESULTS:—Increased Efficiency—Saving in Operating Cost.

We manufacture all kinds of wearing parts subjected to abrasion.

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CONCRETE STEEL CONSTRUCTION

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Designing and Consulting Engineer

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Associate Engineers in each State

HUNT ENGINEERING CO.

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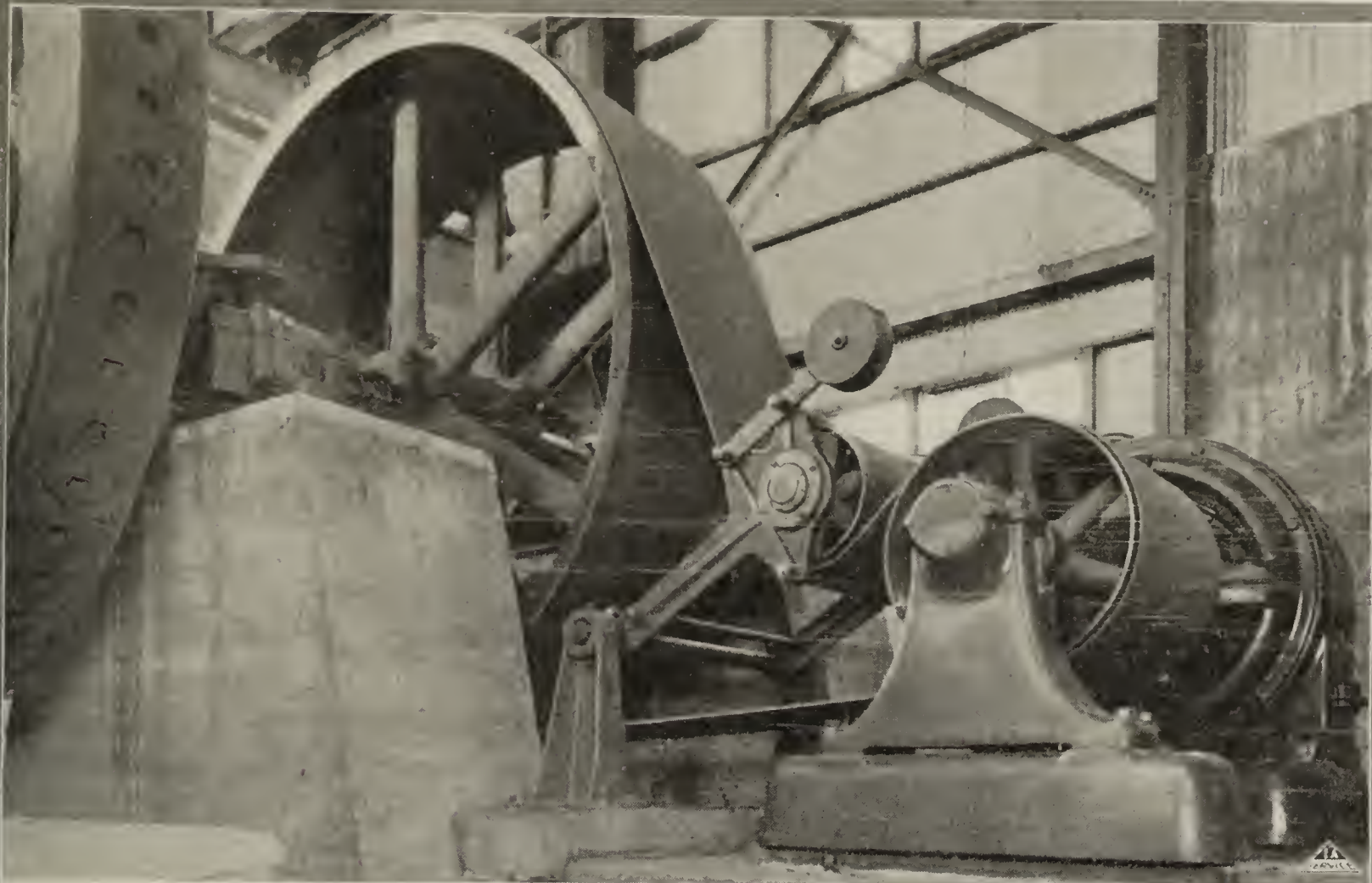
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Kansas City, Mo.



"DUXBAK" on a "LENIX DRIVE"

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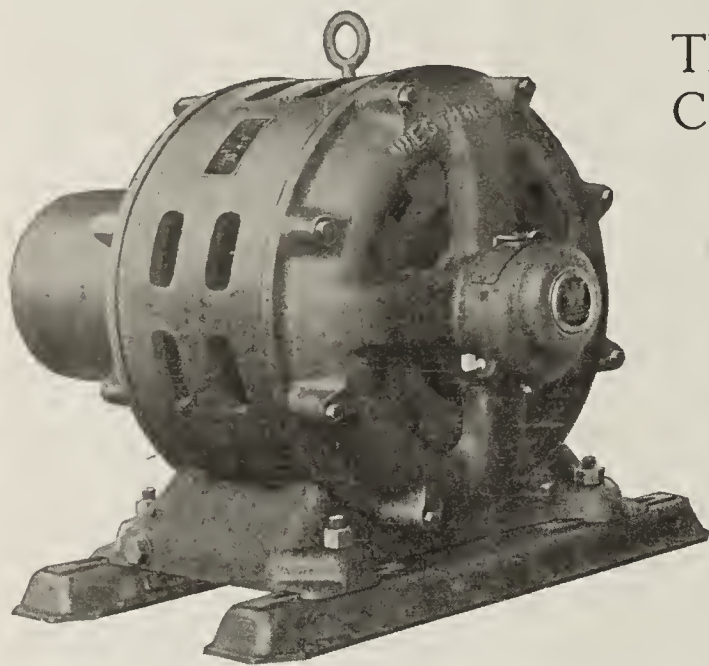
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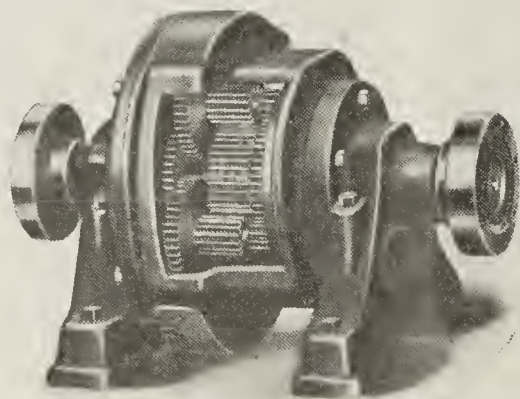
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CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

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CHICAGO, NOVEMBER, 1915

CONCERNING THE ALLEGED BRIDGE TRUST

To the Editor: The letter published herewith is a copy of the one recently sent by registered mail to the Attorney General of Kansas, by Daniel B. Luten, designing and consulting engineer, steel and reinforced concrete bridges, Indianapolis, Ind.:

Oct. 11, 1915.

Hon. J. M. Brewster,
Attorney-General of Kansas,
Topeka, Kansas.

Dear Sir: The newspapers of Kansas have published numerous references to an alleged bridge trust and your investigation thereof authorized by the last legislature. If I can be of any assistance you may call me as a witness in any of your investigations, and I will gladly come to Kansas at my own expense and testify without reservation, and will waive immunity.

Many of the newspaper references either state or imply that you and your assistants charge that I am connected with the alleged bridge trust. I am not connected with any trust, but I am in possession of information that should enable you to prove violation of the Kansas anti-trust law on the part of certain bridge engineers in your state. Also, I have information regarding a conspiracy by the State engineers of Kansas and Iowa and others, to discredit my patents by circulating rumors that I am part of a bridge trust.

Because of the publicity given to the charge that I am connected with the alleged bridge trust, I am sending copies of this letter to the Kansas press.

Very truly yours,

DANIEL B. LUTEN.

THE EFFECT OF MIXING ON COMPRESSIVE STRENGTH OF CONCRETE

It has been more or less common knowledge among practical men for some time that mixing concrete for a longer period than is generally customary resulted

in better and stronger concrete. Just to what extent the strength would be increased by increasing the length of time of mixing was, however, a rather debated and unsettled point on account of the lack of laboratory tests on this subject. In fact, many engineers, although they did not doubt that the strength of concrete was increased by longer mixing, rather discounted the resulting increase as being uneconomical in view of the much increased cost of mixing necessary.

A paper recently presented before the Indiana Engineering Society by H. T. Scofield on this subject discloses some very interesting facts. Briefly stated the tests (seven series of tests with six specimens in each series) show that the strength of concrete was increased from 27 to over 50 per cent by lengthening the mixing periods from 10 to 18 minutes over that of the usual $\frac{1}{2}$ to 1 minute mixing periods. When the mixing period was of longer duration than 18 minutes, and for some mixes 10 minutes, the compressive strength showed a marked decrease, no doubt due to retempering of the concrete which took place by continuing the mixing after initial set of cement began.

Although these tests are by no means complete or conclusive (and should therefore lead to further tests along the same lines), engineers will say, and no doubt rightfully, that to make the mixing period from 8 to 10 times as long as is now common would be more costly than the additional cement required to make concrete of equal strength under ordinary mixing conditions. As an economic proposition, however, the longer or more thorough mixing seems the better, and it therefore behooves the manufacturer to endeavor to put out a mixer which will make a considerably greater number of revolutions per minute than is now common, and in this way by slightly increasing the time of mixing make possible the beneficial results of more thorough mixing.

We venture to say that a great amount of concrete work which has proven unsatisfactory was placed in "record time," which in general means "insufficient mixing." Now, if we intend to make "concrete" stand for "permanence" a fertile field of investigation will be found in "the thoroughness of mixing," as is indicated by the tests cited. [Railway Engineering & M. of W.]

SAND-LIME BRICK MANUFACTURERS' CONVENTION.

The annual meeting of the Sand-Lime Brick Association will be held at the Republican House, Milwaukee, Wis., on December 7 and 8, 1915. Program will be completed within a short time and forwarded to members. A cordial invitation is extended to all manufacturers of sand-lime brick to join in the association work, to qualify and attend and take part in the progressive work of the organization. H. W. Terry, secretary, Lumsden Building, Toronto, Ont., Can., will receive applications and supply all necessary information.

BIG BLAST HOLE DRILLS IN THE BIRDSBORO QUARRY

The Birdsboro Stone Company of Birdsboro, Pa., operate one of the largest crushing plants in the country, having six McCully crushers and two steam shovels. Two Keystone big blast hole drills are continuously in operation in their quarry and the company declare their experience with the deep well drills has been very good. They have decreased the cost of their explosives.

CONCRETE PAVEMENT IN SANDUSKY, OHIO.

The concrete pavement on Fifth and Scott streets, Sandusky, Ohio, is 3,000 feet long, 26 feet wide, and is provided with 4-inch gutter on either side. The entire pavement is 5 inches thick at the edge, and 8 inches in the center, with a crown of 1 inch to the base and 4 inches on the top plane of the pavement, and was laid at one time, although technically it would be called a two-course job.

wet earth for about three weeks and kept free from travel.

The curbs are 6 x 18 inches, of concrete composed of 1 part Portland Cement, 2 parts sand and 4 parts lake gravel. Under the curb were placed 4-inch tile drain in crushed limestone.

H. W. Homberger furnished all labor and equipment and the materials were purchased by the city. In speaking of this pavement recently, Robert L. J.



Concrete Pavement, Sandusky, Ohio.

The bottom course is composed of 1 part cement, 2 parts sand and 4 parts of gravel. There was a layer of the American Steel & Wire Company's 26-gauge diagonal mesh reinforcement laid on top of the bottom course, over which was spread a 2-inch layer of con-

Wager, Chief Engineer of the City of Sandusky said: "I consider this the best way to build a pavement of this kind, as it is easier to get the right proportion of material, which is one of the most essential things in concrete paving.



Concrete Pavement, Sandusky, Ohio.

crete composed of 1 part cement, 1½ parts sand, and 3 parts of trap rock. There were ½-inch expansion joints placed along the curb and extending clear through the pavement. Transverse contraction joints, every 25 feet, are protected by soft steel armour and filled with the same material as the expansion joints, which was the Philip Carey Company's No. 2 Joint Filler. After the concrete had set it was covered with

The cost of this pavement was 55 cents per lineal foot of curb, 6 cents per lineal foot of drain under curb, \$1.30 per square yard of concrete pavement, including joints and reinforcement. Grading, drainage, etc., cost about 35 cents a square yard, making the per foot front cost on abutting property a little less than \$3.00. However, as 1,600 barrels of cement were donated by the Sandusky Portland Cement Co., the total cost of pave-

ment of this kind under ordinary circumstances would be \$3.30 per foot front. The same job constructed of brick or asphalt would have cost about \$4.20 per foot front.

This pavement was finished last Fall, and I examined it a few days ago and found that the winter had not damaged it a particle. It is entirely free from cracks or upheaval caused by frost. It is not any more slippery than brick, nor as noisy. I consider that it will last as long as brick, and probably twice as long as asphalt."

As a result of this excellent demonstration of the superiority of concrete for pavements, many other streets of Sandusky will be paved this season with this material.

ECONOMY IN CONCRETE FLOORS.

A prominent cattle feeder, who two years ago put a concrete floor 30 feet wide and about 150 feet long in his feed lot, recently told us that he considered the investment was one of the most profitable he has ever made on his farm. He is confident that his cattle do better on this floor, especially in the spring, than they used to do when they were obliged to stand in mud and manure up to their knees to eat their feed. Furthermore, they waste less feed—an item of great importance. His feed bunks are so arranged that silage, hay, as well as grain are all fed together, thus saving bunk room and labor. The hay is put in the first thing in the morning, most of which the cattle eat while the silage is gotten out of the silo. On top of what hay is left the silage is thrown. If oil meal or cottonseed meal is fed this is sprinkled uniformly over the silage. An hour or so later the corn or other grain is thrown on top of what is left in the bunks. The cattle are fed only once a day, this having been found more profitable than feeding twice, because of the saving of labor which it effects. Not only do the cattle thrive better on a floor, but every particle of the manure is saved and it can be hauled away any time during the winter months. Thus when spring opens the yard is clean instead of being covered with two or three feet of manure as is usually the case. This farmer is satisfied that the manure from his steers on this concrete floor is worth over twice as much as when left in the old way, which nearly always means that the yard can not be cleaned till fall.

A concrete hog feeding floor is also exceedingly valuable. The practice of throwing corn to the hogs in a muddy yard is extremely wasteful and something that no farmer can afford to do. It was different when corn brought 15 to 30 cents a bushel and cement was expensive. Now cement is cheap and corn worth 70 cents a bushel. It looks like throwing good money away to feed corn on anything but a solid feeding floor. A concrete floor for hog feeding purposes need not be very large and the cost of the necessary cement will easily be saved the first year in better returns from the grain fed, say nothing about the increased comfort of the hogs as well as that of the attendant.

Inside buildings, as in stable and granary, the first cost of a concrete floor is no higher than one of wood, and when gravel is available on one's own farm, or where it can be secured nearby, concrete is cheaper than wood. A concrete floor, when properly laid, will last a lifetime, and longer, while a wooden floor decays in a few years. The prejudice that used to exist against concrete floors for cow and horse stalls and for hoghouses is gradually dying out as their use is increasing.

Before the advent of the small mixers that can now be purchased at reasonable prices, there used to be difficulty in getting the cement, water, and gravel thor-

oughly mixed and the result was frequently a poor job of concrete work, but mixers are now so cheap and easy to get, and concrete is used for so many purposes on the farm, that there should be one in every neighborhood.—[Farmer and Breeder.]

CONCRETE PROTECTION OF BOTTOM FLANGES OF BRIDGE GIRDERS

In a paper read before the Engineers' Society of Western Pennsylvania, on the protection of metal structures, Frederic H. Fay,* of Fay, Spofford & Thorndike, consulting engineers, Boston, points out two reasons why he has not made a practice of using concrete protection completely surrounding the bottom flange of a girder.

In the first place there are many examples of failure of this method of protection, where the concrete cracked at the edges of the flange and gases entered the cracks and ate away the reinforcing metal. The concrete protection then fell from the under side of the flange in sheets sufficiently large to endanger passengers on passing trains.

Secondly, experience covering many years has shown that the bottom flange of a girder is the part least likely to corrode. The worst effect of locomotive gases is found just beneath the bridge floor. The reason for this is that the gases do not hang for any length of time around the bottom flange; but they may be pocketed for considerable periods just under the floor unless ventilation is provided.

Experience has demonstrated that the loss of section from the under side of the bottom flange of a main girder is not likely to be more than a small fraction of an inch in a period of many years. In the case of the upper side of the bottom flange, however, the situation is different. Here dirt may collect and hold moisture, causing relatively rapid corrosion. Hence the care that the author has taken to protect the upper side of the bottom flanges in bridges.

Concrete protection has apparently been used successfully on the under side of the bottom flanges of steel members in train shed roofs. In this connection it should be borne in mind that these roof members are not subject to deflection under live loads. The failure of the concrete protection of the bottom flanges of bridge members was upon floor beams carrying heavy line loads of street cars, and subject to considerable vibration and deflection.

AMOUNT OF WATER IN CONCRETE MIXTURES

Although the tendency is now to use wetter mixtures for concrete than prevailed in general practice some years ago, there is still controversy among self-styled authorities, engineers and contractors as to the proper consistency for concrete mixtures. In most cases, the amount of water used has represented the arbitrary opinion of the engineer or person in responsible charge of the construction.

In reinforced concrete work, there is no question but that wet mixtures facilitate placing the concrete in intimate contact with the reinforcement, but in reinforced work there is a possibility that too much water will be used, so that after the process of crystallization has been completed in the cement, an examination of the concrete would show pockets or voids along the reinforcement.

The average contractor, simply for his own convenience, will frequently use more water in his concrete than necessary, because a wet mixture facilitates spout-

*Formerly Division Engineer in charge of Bridges and Ferries, City of Boston.

ing, and consequently saves time and money in placing expense:

As in all things, there must be a happy medium, so in concrete it is evident that the advocates of dry mixtures and the advocates of wet ones cannot both be correct. Tests have been recorded of experiments made in the Engineering Testing Laboratory of the Sheffield Scientific School, Yale University, involving experiments based on 1:2:4 mixtures, used with varying percentages of water. Conclusions based on these tests showed that concrete mixed with $27\frac{1}{2}$ per cent of water developed at the end of thirty days, a maximum resistance, both to tension and to compression, in comparison with mixtures made with other percentages of water.

Another interesting point brought out by the tests referred to was that to attain corresponding strength in mixtures using 30 per cent and more of water, an increase from 5 per cent upward in materials was required to equal the results shown by the mixtures containing $27\frac{1}{2}$ per cent water.

This means that for concrete to meet certain test requirements, the contractor may give himself a margin of 5 per cent or more for profit by adhering to the $27\frac{1}{2}$ per cent content of water.—Scientific American.

CONCRETE FENCES

At the Edgar Thomson works of the Carnegie Steel Co., at Bessemer, Pa., a very heavy fence, consisting of reinforced concrete panels between posts 8 feet apart, has been built. The posts are 10 inches square and $7\frac{1}{2}$ feet high, with corners beveled and a pyramidal cap at the top. The reinforcement consists of steel rails anchored into the top of an old retaining wall upon which the fence was built. The forms for posts were set up and placed, filled with concrete, and as soon as same had hardened, the forms for panels were erected and the reinforcement placed. Each panel is a separate unit, a tongue and groove expansion joint being provided at each post. The panels vary from 8 inches thick at the top to 4 inches at the center of panel due to the paneling.

The forms for the ornamental caps were placed at the same time as the panels. The concrete used for all parts of the fence was of a 1:2:5 mixture. All edges of posts and panels were given a chamfer to remove the sharp edges, which break and become ragged unless the greatest care is taken in removing forms.

The cost of this fence exclusive of wall was \$1.80 per linear foot, which could be materially reduced for a larger job by special equipment and by using lighter reinforcement, according to Mr. C. E. Dinkey, general superintendent.

Concrete Fence Posts

A second type of fence was built of corrugated steel sheeting on concrete posts with a concrete curb or retaining wall about 18 inches high between posts. This fence, consisting of 88 bays 17 feet long, with a total length of approximately 1,500 feet, is placed as a guard fence between railroad tracks at the Mingo Junction station of the Mingo works of the Carnegie Steel Co.

These posts are of square cross-section, with a taper towards the top and end 7 feet above the footings, which are 20 inches square and 18 inches deep. The posts are reinforced with a $\frac{1}{4}$ inch bar in each corner extending into the footing. Between footings is the concrete curb upon which the corrugated steel fencing rests. This material is fastened to steel angles which are in turn fastened to the concrete posts by steel lugs cast in the posts. The cost of this fence is given as \$1.36 per linear foot.

THE MOTOR TRUCK AND THE CONTRACTOR.

By B. A. Gramm*

Taking into careful consideration all of the many ideas that have been developed and brought into use for the economical work of the contractor and road builder, nothing in any way approached or compared with the motor truck equipped with hoisting body. This has now been brought down to such a science that the stone or whatever material is being hauled cannot only be placed on the road from either short or far distances in the quickest possible time and be dumped in fifteen to twenty seconds, but the connection between the hoisting body and the forward and reverse movement of the truck is so perfected that the material may be spread in any desired thickness at the same time it is being dumped.

Basing on actual results, observations and reports from our many customers, we have found that outside of cases where the owners overdid and thoroughly abused the proposition, that there has never been anything brought to their attention that makes the tremendous saving in time and expense as the present equipment. We do not believe that this side of the question would be argued by anyone. The savings have come to a point where the average time in which you can positively pay the entire purchase price of one of these trucks based on the difference between the cost of men and teams and the same amount of work done by the truck is nine months. In other words, if the same payroll or expense that would have to be paid out to the owners of teams for hauling the road material a given length of time would be paid on the purchase price of motor trucks to haul the same tonnage with an average of nine months, the savings alone would pay the investment. That would leave the owner of the truck an opportunity to go over them during the winter months, and his trucks would then cost him nothing for the next two or three years, so that the value of them would amount to that much additional profit on his work.

It is a conceded fact now that road contractors who have thoroughly equipped themselves with the modern motor trucks with hoisting bodies can bid lower to the extent of the cost of these trucks in obtaining their contract, but before we show the manufacturer's side allow us to say that wherever you find a contractor whose experience has been otherwise than stated above, you can absolutely trace it to two causes—one is the inefficient methods that he has pursued in the managing of his motor trucks, and the other is the fact that he has purchased a cheap make of truck, which has never been properly designed or built of the right kind of material to stand the work for which it is intended, for in no machinery ought as much care, as well as the cost, be looked into as a motor truck.

The other side of the question, which has never been brought out to our knowledge by any of the magazines, is the fact that so many road contractors, who want to take advantage of the tremendous savings, go to the manufacturer, and we will grant that they are led to believe that these things can be brought about through the many truck salesmen, who will go to almost any extreme to sell their trucks, and their idea in the first place to get the price of these trucks down below the actual cost of their production, and then they insist that the manufacturer sell it to them on long time payments.

Now, let us see the other side. We manufacturers have been the pioneers to bring about this great evolution in transportation, and our pioneer efforts have cut

*Vice-President and General Manager The Gramm-Bernstein Co., Lima, Ohio.

the roads through that have made all this possible, has been brought about through the expenditures of vast sums of money and other many failures that have been costly. The present purchasers of trucks have never contributed one single dollar towards this large fund.

The building of our plants to produce these trucks has meant another large investment of cash. Our machinery has meant another large outlay of money and our material must be paid for. Unless we take advantage of cash discounts, we are unable to get our costs down to a point to where we have margin left for our efforts. Our payrolls have certainly got to be paid for or we immediately go out of business, therefore the financing of our side of the question is a heavy one.

Now, after producing a piece of machinery that brings to the contractor the tremendous profits that he must admit are there and gives him the opportunity of having this wonderful chance at no extra investment at all, but the simply the paying of what he spends in payrolls and costs to teams which he never gets any returns on turned into the payment of these trucks, the contractor, without any seeming thought of this side, tries to purchase and insists on wanting to buy these trucks on long time payments, or in other words,

tremely low prices is in a position where, through the inferiority of his article, he is compelled to go to these limits in order to sell his product and that the customer in the end will pay dearly for what seems to him accommodation.

EFFICIENT HAULING WITH MOTOR TRUCKS AND RAPID UNLOADERS

One of the primary requisites in the successful operation of the motor truck in contracting work is keeping the truck moving. Every moment lost while the truck is standing idle, in being loaded or at other times, means a noticeable decrease in the efficiency of operation. For the use of motor trucks on road work or other contracting work requiring the hauling of materials, some form of rapid loader is a necessity.

The accompanying photograph shows a successful loading and hauling outfit operated by Westrick & Line, contractors, Holgate, Ohio. With this equipment, consisting of 5-ton motor trucks with dump bodies and a Galion Eclipse portable unloader (manufactured by the Galion Iron Works & Mfg. Co., Galion, O.), excellent results were obtained. On a 4-mile haul, carrying 5 tons of crushed stone to the load, the trucks



Galion Eclipse Unloader loading a 3½ ton Grammm motor truck, 81 cu. ft. body, with crushed stone for road building purposes, 4 minutes is necessary to load, thus insuring constant operation of truck.

asks us manufacturers to finance his business. If the present prices are to be ever materially reduced it has got to be brought about by allowing the manufacturer to produce his goods on a less investment of actual cash to the manufacturer.

A contractor may say that it is impossible for him to put up the lump sum for these trucks at one time, while he can spread his payments to the teams in payrolls over the period of nine months. However, he can get the advantage of a liberal cash discount by going to his banker and borrowing the money, making his arrangements to pay to the local banker the same amount of money every month he would be paying out to the teamsters. In that way his notes to the bank would be constantly reduced until it was finally wiped out without any effort on his part, and at the end of the time his truck would stand him nothing. The truck manufacturer will be giving the truck to the contractor at a lower price, and through his bank be able to obtain the cash on his payments, is in position to obtain his cash discounts, and thereby bring about a satisfactory arrangement to all concerned. The truck manufacturer is besieged from all sides with expenses, and we believe if these thoughts would be more seriously taken up and gone into that far better results would be obtained.

Don't forget that any truck manufacturer who offers you high grade dumping trucks on long terms and ex-

averaged 45 minutes per trip, including loading, dumping, spreading, etc. This was made possible through the rapid handling of the material by the unloader, which kept the trucks moving constantly. With the unloader, one man handled approximately 250 tons of stone during the 10-hour day.

The unloader consists of a wooden hopper bin mounted on posts on steel trucks and a ¾-cubic yard bucket moving on a trackway. At the lower end of the wooden frame are posts which let down and take the strain off the trucks when the bin is in use. The bucket is operated by a gasoline hoist under the bin, the hoist line leading from the drum to a pulley on a rectangular frame above the bins and thence to the bucket.

In operation, a small pit is dug beside the track on which the cars of material are brought in, with one side sloping up under the track, between two of the ties. This accommodates a chute which catches the stone or other material as it drops from the pockets in the bottom of the car. The bucket is run into the pit, the chute gate lifted and the stone allowed to fill the bucket. The gate is then closed and the bucket hoisted, the material being dumped automatically into the bin.

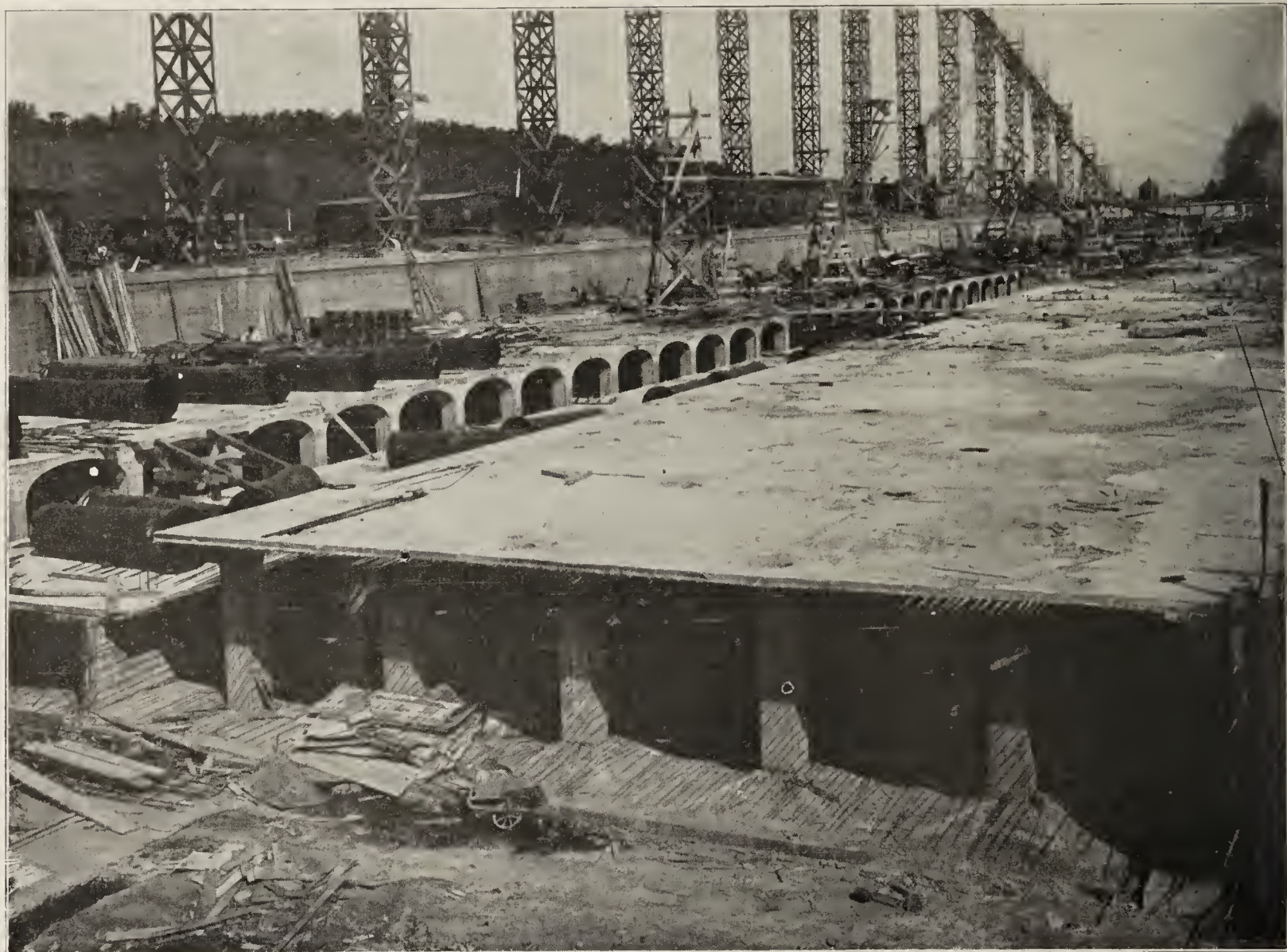
The motor trucks simply drive under the loading chutes, which are lowered until the material runs out, filling the truck, when the chutes are again raised.

ST. LOUIS FILTRATION PLANT

St. Louis was probably the first City on the Western Continent to seriously contemplate filtration as a method of purifying its water supply. In 1865, Mr. James P. Kirkwood, then chief engineer of the Water Works, was sent to Europe with instructions to investigate and study the processes of clarifying river waters there, so that some similar methods might be adapted to the Mississippi waters at St. Louis. Mr. Kirkwood reported to the Board of Water Commissioners the results of his investigations in 1866, and recommended slow sand filters, outlining a tentative design for their construction.

The following year the work of building new Water

settling capacity was deemed an immediate necessity. Two years later, under the new charter of the City, the Water Works were placed in charge of a Water Commissioner, Thomas J. Whitman, who at once called attention to the inadequate settling capacity, recommending the passage of legislation to reduce the waste of water, which he estimated at fifty per cent of the total pumpage. Year after year Mr. Whitman emphasized the necessity of enforcing ordinances prohibiting the waste of water, but found the people unconvinced by his logic, just as succeeding Water Commissioners in later years have met with the same unreasonable opposition on the same subject. So that against his better judgment he was forced to build more pumps



St. Louis Builds World's Largest Mechanical Filter Plant

The design provides for forty 4,000,000 gallon daily filter units, each 50x28 ft. in plan, supported on concrete columns 20 in. square spaced 11 ft. on centers north and south and 10 ft. 3 ins. on centers east and west

On the original basin floor inverted concrete arches were laid to distribute the foundation loads of the columns. The filter boxes rest on the reinforced concrete floor formed by leveling up the groined arches joining the tops of the columns. Each filter box is poured as a monolith, the concrete mixture being 1:2:4, with 25 lbs. of HYDRATED LIME ADDED FOR EACH BARREL OF CEMENT, FOR THE PURPOSE OF MAKING THE BOXES WATERTIGHT.

Works for the City was started at Bissell's Point, although Mr. Kirkwood does not seem to have altogether lost hope for the adoption of his filter project until 1869 when he writes, "The public mind of St. Louis, so far as it has been expressed, does not seem inclined to consider filtration important."

The new works, completed in 1871, were designed to provide for clarification by sedimentation only, four settling basins being built, each 277 feet wide by 600 feet long, and holding about twenty million gallons each. The city at this time was using about fourteen million gallons of water per day, so that the basin capacity was more than five times the average daily consumption.

In 1875 when the average daily consumption was slightly above twenty million gallons, an increase of

to keep up with the consumption. No more settling basins were built and in 1884, during the extremes of temperature, the water supplied the consumer was practically pumped directly from the river, since it passed through the basins so rapidly that little or no settlement took place. These conditions continued, increasing year by year in length and frequency of period, until in 1887, it was decided to locate new works at the Chain of Rocks.

In 1885 the Board of Public Improvements recommended building new works at the Chain of Rocks, and the construction of filter beds in the existing basins at Bissell's Point, with an alternate proposition of building the filters at the Chain of Rocks at an increased cost of \$350,000.00. The filters proposed at that time were slow sand, estimated to filter two mil-

lion gallons per day per acre, and of sufficient size to supply fifty million gallons per day.

From August 18, 1885, until February 23, 1887, tests were run on experimental filters to determine the comparative value of the upward and downward systems of filtration as applied to the Mississippi water at St. Louis. The raw water was applied to the filters without the use of any coagulant.

The data obtained in these experiments does not seem to have encouraged the authorities to undertake filtering the river water, so that the construction of the Chain of Rocks low service pumping station, with six settling basins, each 670 feet by 400 feet in plan and with a combined capacity of 180 million gallons, was commenced in 1887. This plant was put in service in 1894.

Again in 1900 plans for mechanical filters with a rated capacity of 120 million gallons per day were prepared, but the administration was not favorable to the scheme, principally because the people of the State of Missouri, as well as of the City of St. Louis, had been prejudiced against the use of alum in baking powders, and the proposed use of alum as a coagulant in the preliminary treatment of the water supply was sufficient to kill the project. Thus filter construction in St. Louis was defeated for the third time in thirty-five years.

In 1903, the Water Commissioner, Mr. Ben C. Adkins, with the writer as his principal assistant, was appointed by Mayor Rolla Wells, with the express understanding that, before the opening of the World's Fair in May, 1904, some scheme must be designed and put in operation to clarify the water supply. It is unnecessary to enter upon any history or description of the experiments and methods used during that year, since the fact has been well advertised and is generally known, especially among Water Works engineers, that the St. Louis water supply was clarified and purified without the use of filters and by a process of coagulation and sedimentation. Also it is equally as well known that the process has been in successful operation for about ten years. About two years ago it became evident that the capacity of the system of purification in use was too small for the treatment of the quantity of water consumed by the city. The eight years of operation of the purification process had also forced all of us who had been connected with the installation and development of the process, to reluctantly admit that it was not as efficient as filtration; that there were difficulties of operation that had not been satisfactorily overcome; that there were objections that could not be altogether removed. Whether to increase the capacity of the system by perpetuating the method in use, or by utilizing the machinery and basins for the preliminary treatment of the water, and then passing it through rapid sand filters, became principally a question of economy in first cost and operation. Careful estimates on the cost of increasing the capacity to treat 150 million gallons per day showed that to build additional basins, conduits, etc., to enlarge the present system would cost at least \$250,000 more than to build a rapid sand filter plant to supplement the treatment in existing basins. It was also estimated that the cost of treatment and operation would be less with the filters. Considering also the unquestioned fact that the general quality of the water would be improved, and that a uniform clarity of water would be insured by filtration, there could be no hesitation in making a decision between the two propositions.

In January, 1912, the Water Commissioner was authorized to prepare plans and specifications for changes and additions to the existing works at the Chain of Rocks, including the filter plant, so as to

bring the working capacity up to 150 million gallons per day.

The filters are located in the western portion of basin 7, occupying a space approximately 700 by 140 feet. The filters were located in the basins, rather than on ground outside for several reasons, for example, the space taken from the basin could be readily spared, since ample basin capacity for coagulation and clarification would remain, construction could proceed more rapidly since no excavation was necessary, better and more convenient arrangements for utilizing existing conduits and making new basin connections could be had, and on the whole the cost would be decreased by such a location.

The design provides for forty filter units, each 50 by 28 feet in plan, supported on concrete columns 20 inches square, spaced 11 feet centers north and south and 10 feet 3 inches east and west.

On the original basin floor inverted concrete arches were laid to distribute the foundation loads of the columns. The filter boxes rest on the reinforced concrete floor formed by leveling up the groined arches joining the tops of the columns. Each filter box is poured as a monolith, the concrete mixture being 1, 2, 4, with 25 lbs. of hydrated lime added for each barrel of cement, for the purpose of making the boxes watertight. The concrete in the columns and arches is composed of a mixture of 1:2½:5. Screened and washed gravel has been used throughout for the coarse aggregate.

The strainer system consists of the channel type, in which the drains are formed by and between concrete ridges, and covered by perforated strainer plates anchored to the concrete by bronze bolts and bars. Along the center of each half of each filter unit is formed a collecting channel, 28 inches wide by 5 inches deep, into which all the small lateral drains 3 inches wide by 5 inches deep empty. Four ten inch openings in the bottom of each collecting channel are connected by cast iron pipe to the effluent conduit.

The water will be filtered through 30 inches of sand and 12 inches of gravel. The gravel will be placed on the filter bottom in three layers, the bottom layer of 5 inches in depth, composed of gravel, ranging in size from ¾ to 1½ inches in diameter, the second layer 4 inches in depth, size from ⅜ to ¾ inch, and the top layer 3 inches deep, size from 3/16 to ⅜ inch. The sand will have an effective size from 0.40 to 0.50 m.m., and a uniformity coefficient not greater than 1.65.

The gallery between the filters contains the effluent conduit, 15 feet wide and 4½ feet high, over which lies the 36 inch cast iron wash water pipe, and above that is the influent flume, 15 feet wide and 10 feet deep, into which the water is drawn at each end of the filter house from basins 7 and 8. Both the influent and effluent flumes are built of reinforced concrete. The cover of the influent flume will be the operating floor of the filter house. Each filter has a 24 inch connection to the wash water pipe. All drainage and wash water from the filters is carried through 30 inch sewers to the main sewers and thence to the river.

The rate of flow through each filter will be maintained by a rate controller placed on the 24 inch effluent pipe. Each controller can be set to maintain any desired rate of flow between 1,500,000 and 5,000,000 gallons per 24 hours, regardless of the difference in head on the two sides of the controller, which difference may amount to as much as 14 feet.

The registered flow shall not vary more than three per cent from the actual flow below the 2,500,000 gallons daily rate, nor more than one and one-half per cent when the rate is above that amount. These 40 individual controllers will be connected to a master controller, which when set at any desired rate of flow,

will automatically set the individual controllers on each filter at the same rate.

The operation of each filter will be handled from an operating table on the central gallery floor. These tables will be equipped with valve levers, gages and sample pumps. The 24 hour records of the height of water on the filter, the loss of head through the filter, and the actual quantity of water passing through the controller will all be kept on one sheet. A recording gage will also show the elevation of water in the effluent conduit at the center of the filter house.

Venturi meters with recording attachments will be placed on the 36 inch wash water pipe and on the outlets of the collecting conduit. These meter records, together with the individual records of each filter will afford independent measurements of the quantity of water passing through the plant, and which again may be checked against the pumping records, which are also made by Venturi meters.

The filter house, which will entirely cover the filters, will be built of concrete with metal window sash and frames. The ceiling beams will be almost 12 feet above the operating floors at the side walls, the slope of the roof from the central gallery being one-half inch to the foot. On the concrete roof will be placed the ordinary tar and gravel covering. The building, which covers an area of 699 by 134 feet will be heated from a steam plant in the head house. The current for lighting the filter and head houses and for operating motors will be furnished from a generator house, located at the south end of the pumping engine house. This generator house will be a brick building 58 feet by 66 feet, conforming architecturally to the existing buildings at the pumping station. The machinery will consist principally of two 250 k.w., steam-driven units.

The head house is to be a four-story concrete building located 34 feet south of the filter house. On the first floor will be three 150-horsepower tubular boilers, four alum solution tanks, two alum solution pumps, three 12-inch centrifugal pumps for filling the wash water tanks, two 6-inch pressure pumps for operating hydraulic valves, a 4-ton refrigerating plant for manufacturing ice for the department, a store room for hypochlorite of lime and liquid chlorine, and a small machine shop; on the second floor will be located an office, a small laboratory, six alum mixing tanks, wash rooms, lockers and store room; two wash water tanks, each 50 feet in diameter and containing 175,000 gallons of water, will occupy the greatest part of the third and fourth floors. The dome-shaped covers of these tanks will form a portion of the roof of the building. There will be space on the third floor for the solution tanks for hypochlorite of lime and for the liquid chlorine apparatus, and on the fourth floor the space will be utilized for hypochlorite mixing boxes, and storage for alum. Alum, coal and other supplies will be delivered in cars on a switch alongside the head house. Alum will be unloaded from the cars into an elevator chute, from which it will be elevated and conveyed to the storage bins on the fourth floor.

The basins, excepting 7 and 8, will be used as primary coagulating basins, and will be operated in parallel, the present system of series of operation being abandoned. Before the water reaches these basins and before any chemicals are used, it will pass through a grit chamber 70 feet by 100 feet where the heaviest of the matter in suspension will be precipitated. As the water leaves the grit chamber it enters the first channel of the mixing chamber, where it will receive the charge of lime. The mixing chamber consists of four parallel channels, each 7 feet wide by 11 feet deep, through which the water may be directed in series or in parallel. Used in series the water will be made to

travel about 10,000 feet between the grit chamber and the filling conduit, while by using the channels in pairs only one-half that distance will be traversed. The object in varying the distance through the mixing chamber is to be able to approximately regulate the carrying capacity of the chamber to the variable quantity of water being pumped, so as to maintain the velocity sufficiently high to prevent settlement in the channels.

The effect of the passage of the water through the mixing chamber is to insure the thorough mixing of the milk of lime with the water and also to allow a longer time for the softening action of the lime before the sulphate of iron is added. This will result in an estimated saving of from 40 to 50 per cent in chemicals, because of the elimination of loss due to incomplete chemical reactions. The water on leaving the mixing chamber and entering the filling conduit will receive the charge of sulphate of iron. The inlets from the filling conduit to each basin will be baffled to prevent direct flow across the basins. The water will be drawn from the primary basins into a concrete collecting conduit, located between the two sets of basins. From this conduit, it will be delivered and measured through two Venturi meters, with 56 throats, into a chamber 75 feet wide, extending the full distance east and west across the north end of basin 7. As the water enters this chamber, it will receive any secondary treatment that may be necessary, before it is drawn into basins 7 and 8, or the supplementary addition of hypochlorite of lime or liquid chlorine may be made just before the water goes to the filters or these chemicals may be applied to the filtered water as it leaves the filter house.

The rated capacity of each of the forty filter units is 4,000,000 gallons per twenty-four hours, or 160,000,000 gallons per day for the plant. This output may be increased to 200,000,000 gallons per day, should it become necessary to supply this amount of water.

The contract for the concrete substruction, filter boxes, conduits and connections, was awarded to the McCormack-Combs Construction Company of St. Louis for the sum of \$225,023.10. Because of the location of the filters in basin 7, it was possible for the contractor to design a comparatively simple plant for mixing and placing concrete. A switch track was laid along the basin wall, so that material could be dumped from cars into bins above the mixer, which was placed in a pit 22 feet below the surface of the ground. One of the bins holds about fourteen cars of gravel, the other about ten cars of sand, while the adjacent cement shed will contain 1,500 barrels of cement.

The concrete mixer discharges into a skip operated in a tower 119 feet high. From this main tower chutes run for the entire length of the filters, a total of about 700 feet. Concrete can be taken from the main chutes at any one of the twelve towers and carried to any part of the work. The grade of the main chutes is 20 per cent. They are made of wood, lined with sheet iron, are 12 inches in width and depth and span 45 feet between towers. The movable chutes are made of steel in one piece, and are 12 inches wide by 10 inches deep.

The velocity with which the concrete flows from the main tower to its destination is about 480 feet per minute.

The mixing and placing of concrete was begun on July 17, 1913, and up to February 1, 1914, a total of 165 working days, 14,427 cubic yards of concrete had been poured. This included the entire substruction, 38 filter boxes, the effluent conduit and the greater portion of the influent conduit. Twenty-four filter boxes were poured during twenty-seven consecutive days in December and January, each box containing 107 cubic yards. The cost of erecting form work for the walls, col-

umns and arches was \$1.65 per cubic yard of concrete, and for the effluent conduit \$1.55 per cubic yard.

Following is the list of contracts let, and the estimated costs of the work necessary to complete the plant:

1. Filters, McCormack-Combs Construction Company	\$ 225,023.10
2. Filter equipment, Pittsburgh Filter Manufacturing Company	398,200.00
3. Filter house, McCormack-Combs Construction Company	89,730.00
4. Head house, estimated cost.....	185,000.00
5. Waterproofing basins 7 and 8, estimated cost	50,000.00
6. Raising division walls, estimated cost	85,000.00
7. Generator house, estimated cost.....	50,000.00
8. Mixing chamber, estimated cost.....	160,000.00
	\$1,243,953.10

Contracts for the last five items will be let within sixty days, and it is intended to have the plant ready for operation by November 1. All contracts will require completion before that date under heavy penalties for overtime.

This plant, when, completed, will be the largest mechanical filter plant in the world.

CRACKS IN PLASTER

Even the best workmanship and materials are not always a guarantee against cracks in a new plaster ceiling. Settlement of foundations and shrinkage of joists are two insuperable causes. Where only superficial hair-cracks result they may be easily filled with plaster of Paris, which will make them impossible to detect under a subsequently applied decoration or papering. But if the cracks are wide and numerous, filling them is apt to make a patchy ceiling and is besides a tedious task. A better remedy is to stretch cheesecloth over the entire ceiling, pasting it in the same manner as paper is applied. Owing to the accommodating elasticity of the cloth, both existing and future cracks are covered, and the material has besides an interesting texture which asserts itself through the painting, where that method of decoration is used. If the walls of the room have a frieze and picture mould, the cloth can be carried down the sides and its edges hidden under the mould. Where a very rough texture is desired a heavier cloth can be substituted.

However, because a remedy has been found, one should not be careless about the causes of ceiling cracks. They should be in mind when the frame of the house is put up and guarded against, as far as possible, by setting timbers and studding in such a way as to reduce shrinkage to a minimum. By this is meant reducing the horizontal wood. Ordinary pine or spruce will shrink about a half inch to the foot across the grain; therefore, as little as possible should be used in that position. The shrinkage of wood on end is almost imperceptible. A well framed house with studs running from sill to roof and with ledger boards notched into the studs, would require only the floor beams on the horizontal. A poorly framed house, such as contractor-builders usually put up, would have short lengths of studs end to end at each floor, with two inserts of joists to carry the floor beams—in all about twelve inches of horizontal timber with a shrinkage of half an inch. This, in the whole height of the house might run into several inches and no end of ceiling cracks. This careful framing up is one of the differences between an architect's house and a builder's. [Home Beautiful.]

NEWAYGO PORTLAND CEMENT COMPANY URGES MUSKEGON RIVER BE NAVIGABLE

That the Newaygo Portland Cement Company will be able to double the size of its plant and double its daily output if Muskegon river is opened to navigation and it can place cement on the Chicago market to compete with other cement manufacturing concerns will be one of the arguments made before Major F. W. Alstaetter of the United States army at the hearing to be held at Newaygo next week.

The Newaygo board of trade has compiled information, based on the 1910 census returns, of the amount of crops grown and stock grown in Newaygo county within 15 miles of the borders of the river in order to show Major Alstaetter why the river should be opened to navigation.

Congressman James C. McLaughlin, Robert B. Lane, ex-supervisor of Egelston; Major Alstaetter and his assistant, J. P. John, superintendent of the cement company; H. W. Sawyer, resort property owner, and O. E. Atwood, a leading Newaygo farmer, will make the down-river trip from Newaygo to Muskegon. The trip will begin Wednesday afternoon, following a luncheon to be given by Newaygo business men after the hearing.



20,000 gallon tank, Marine Biological Station, San Diego, Cal. Irving J. Gill, architect. Tank and panels are built of metal lath, plastered with concrete. Posts and girders are reinforced concrete.



Fig. 3.

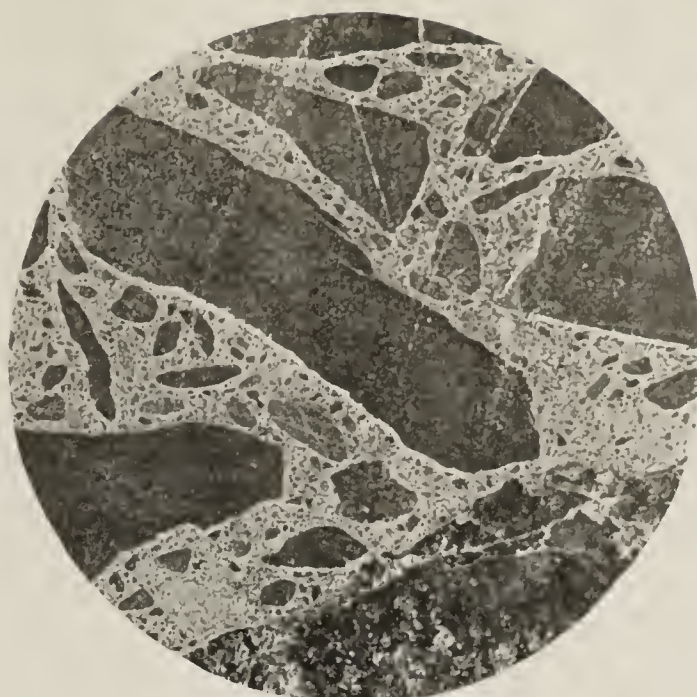


Fig. 6.



Fig. 4.



Fig. 7.

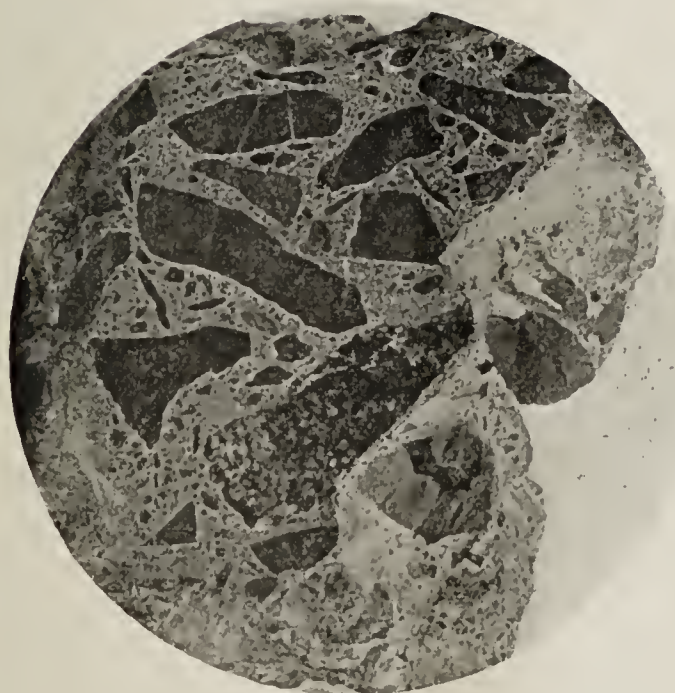


Fig. 5.

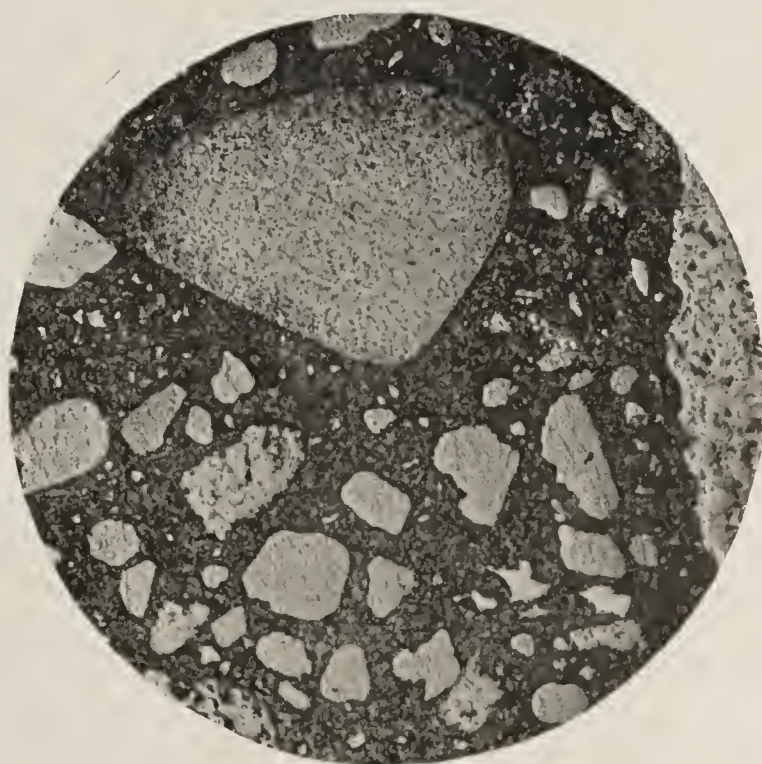


Fig. 8.

considerable misapprehension as to the causes of faulty hydration, though not as to the extent or degree to which hydration commonly proceeds. The obtaining of better hydration is a very vital problem in the concrete industry, but to effect this on a commercial scale in the manner above outlined would be virtually impossible.

In regard to the microscopic investigation of cements, the process is, in general, similar to the microscopic examination of steels in metallography which has already proven of the greatest benefit to the steel industry. And as is done with specimens of steel, a single surface only is polished, the structure of this being developed by various reagents and observed through the microscope by reflected light. This renders possible the ready examination of composite materials, which would otherwise require the greatest patience and skill in their preparation.

The use of the photographic camera in connection with the microscope is but carrying the process a step further. On the microscope stage is mounted the polished and surfaced specimen, on which the light is concentrated by a bull's-eye lens. Above the eye-end of the microscope is mounted an ordinary photographic hand-camera with its proper lens removed; and on the ground glass at the top, for which may be substituted the sensitized plate, is projected the enlarged image of the structure of the specimen.

To ensure a thorough understanding of the evidences and effects of hydration of cement, it may be well to consider here the nature of the process involved. The completed cement derives its usefulness from the hardening produced shortly after its admixture with water. There are, however, two stages in the passage from the semi-fluid state of gaged cement to that of the hardened. In the first stage the mass loses its plasticity and becomes more or less friable. In the second stage consolidation takes place, the mass increasing in hardness until a stony texture is obtained. These two stages are respectively distinguished as "setting" and "hardening."

It follows from the complex character of its composition, that the reactions involved in the setting and hardening of Portland cement are themselves complex. It seems probable, however, that the reactions of setting involve the formation of super-saturated solutions and the deposition therefrom of close-knitted, interlacing crystals of various substances, while the slower reactions of hardening consist partly in the formation of similar interlacing crystalline products, but more especially in the production of a colloidal glue, which is, probably colloidal calcium hydrosilicate, and its gradual desiccation.

The colloidal interpretation of the hardening of cements is due to the late Dr. Wm. Michaelis, who reasoned that a pure crystallization process, as in the case of plaster of paris, can never cause hydraulic hardening, for a conglomerate of crystals, however insoluble, cannot produce impermeability, since crystals have plane surfaces with voids between them which would admit water. On the other hand, hardened cement mortars are impermeable, so that crystallization alone could not confer on them their valuable properties. Dr. Michaelis found the medium responsible to be the colloidal silicates formed in the later stages of hydration.

Illustrative of such structures and also of the primary crystalline formations which have been indicated as being responsible for initial set, in Fig. 4 is shown a surface found in a concrete 34 years old, taken from a dock wall in New York harbor. The production of these crystals was quite unlooked for, being due to an

unusually delicate etching of the piece of clinker after polishing. It should be remembered that this magnification is high (200 diameters) and that these crystals are formed on a single particle. Multiply such interlacing formations a few million times for each cu. yd. of concrete, and it might be expected that a very considerable degree of mechanical strength, quite comparable to the strength of initial set, would be developed. This particular crystalline formation is shown tentatively, however, in this connection, as its identity with those chemical compounds known to be responsible for initial set is as yet conjectural.

But since this attack on the problems of hydration is primarily engineering, rather than chemical, and must therefore necessarily be identified with a study of actual concretes, it becomes necessary to make sure that there is a proper understanding of the internal structure of concretes and of the relative size, position in the mass and importance of the several constituents.

In Fig. 5 is shown a sectional concrete specimen, weighing about ten lb. and about 8-in. $\times$ 6-in. $\times$ 1.5-in. size. It should be noted that none of the aggregate, whether large or small, so far as they are here visible, are touching at any point; rather, they are widely dispersed. But void determinations on this stone were made when the pieces were in at least point contact. Evidently, the voids must have been increased enormously by this dispersion; and if similar dispersion obtains for the finer materials as well, it is no wonder that proportioning concretes on the basis of void determinations has become discredited.

In Fig. 6 is shown a section of the same surface, but at twice the magnification, in order that the finer materials may be made visible. So far as they can be seen, this same dispersion obtains. Carrying the magnification to four times the original, as in Fig. 7, this is made even more apparent; carrying it to 20 times the original, by means of photographing through the microscope, shows, as in Fig. 8, that all the aggregate in sight are sand grains of greater or less size, separated, as were the pieces of stone, and with still finer particles, too small to be sand, lying between them. Magnifying this same field to 60 times the actual diameter, as in Fig. 9, shows the sand grains in increased size, with a relative increase in their mutual dispersion; and a peculiar honeycomb structure on the smaller particles lying between them. Magnifying a portion of this same field 200 times, as in Fig. 10, this honeycomb structure is revealed more definitely. Since elimination of stone and sand from the known composition of the concrete indicates this honeycombed particle to be unhydrated cement and as similar formations occur profusely throughout all concretes, it becomes important to identify them beyond question and to study their functions in the rigid concrete mass, for, if they are unhydrated cement, lying inert, they have a most important bearing on the strengths of concrete.

The easiest identification is offered by comparison between the known and unknown material. In Fig. 11 is shown the structure of a neat cement briquette as viewed through the microscope at a magnification of 60 diameters. Comparing this with Fig. 9, which has the same degree of magnification, the identity of the two materials is strongly indicated. But to make this more certain, in Fig. 12 is shown the central portion of Fig. 11 but at a magnification of 200 diameters. Comparing this with Fig. 10, which shows the unknown material found in the concrete, their general characteristics are seen to be identical.

In an early paragraph of this paper, the proportion of material in standard sand mortar, which was then stated to be unhydrated cement, was seen to be large.

In view of what has just been demonstrated, the truth of this statement is not difficult of proof. In Fig. 13 is shown a section of surface of a standard sand briquette, photographed at a magnification of 200 diameters. The structure of the cement group is here shown in an increased size, with the segmental edges of grains of standard sand, in its near neighborhood. Since in this briquette no materials other than cement, standard sand and water were used, the photograph serves as further proof of the identity of the questioned structure.

It may be objected, however, that this particle is too large to be a cement particle, and that if it were a group of cement particles, they would hydrate and fall apart. To answer this objection, recourse must be had to a consideration of the physical actions involved in wetting dry cement with water.

In Fig. 14 is shown at a magnification of 30 diameters the appearance of dry cement as it lies on a microscope slide. This cement film is very thin, a mere surface dust, but it will be seen that the distribution is very uniform. But if water is added, quite different conditions obtain. In Fig. 15, the water may be seen progressing across the field. Where the water is, there is not, as might be expected, a uniform wetting of the dry powder, but instead, the fine material is grouped in masses of varying size, and it is plain that some extraneous force would be required to break up these masses, since they evidently are in their present positions in obedience to the action of certain forces which have moved the particles from their original place.

The truth of this is easily demonstrable. Surface tension—that peculiar chain of action and interaction which causes rain drops to assume the spherical form—gathers the particles together in groups; and the finer they are, the more easily are they affected. The fineness of cement particles is, in this respect, a detriment to efficient hydration.

But in the process of this grouping, the particles have become slightly wetted. This has immediately resulted in reactions with the cement; and as the quantity of water is necessarily limited by the close grouping of these fine particles, a saturated solution between them, with deposition therefrom of the interlacing crystals before noted, has speedily resulted. In far shorter time, therefore, than is required for initial set under usual conditions, these little groups of particles have become consolidated; and unless the mechanical agitation of mixing is sufficient to break down this crystalline bond, they will remain unhydrated, save at their outer surfaces, so long as the concrete endures. This condition of affairs is difficult to overcome, even by the mechanical action of mixing, as the very small size of the groups renders unlikely their physical dispersion by the agitation of relatively large materials such as sand or stone, which by reason of the water present, are out of contact with one another. This is partially true regardless of the extent to which the process is prolonged. Further, the bond between these particles is speedily rendered more secure by secondary colloidal formations, with their desiccation by absorption of water by the interior of the mass. These colloidal boundary and bonding masses form the honeycomb structure seen in the photograph. Their appearance as white boundaries in some slides and dark boundaries in others is due to the method of polish-attack used in developing the surface prior to its examination.

This grouping and quick-cementing action, therefore, is the reason that the experimental apparatus developed proved inadequate for the task. This is particularly true of later forms, for in them the number of atomizing jets was increased to such an extent

that the fine drops, though initially of a size suited to an individual cement particle, were in such numbers as to coalesce; and the larger drops thus formed caused, by surface tension, grouping of cement particles, such as has been shown. It is evident that means other than those at first proposed are required to produce effective hydration.

With a view to ascertaining the results produced by field conditions, as distinguished from the laboratory-made specimens which have thus far been examined, sections of a few concretes obtained from actual construction were examined. A large number of specimens of concretes were collected from representative structures throughout the world; and the author desires to take the opportunity here presented of extending personal thanks to the many engineers who have been so kind as to supply the samples asked for. Without their aid, the scope of this research would have been much restricted.

Examination of these specimens shows that similar conditions exist throughout the entire mass of each and since none of the specimens is over 1 cu. in. in volume, the quantity of cement remaining unhydrated through such grouping in each cu. yd. of concrete is a matter to ponder upon. It is easy to extend like illustrations to a far greater length with the data already at hand, but the series above given, covers a wide range of classes of concrete of varying ages and conditions of service, and made under widely different conditions. Grouping of particles in the manner indicated is a characteristic of all concretes so far examined; and because of this grouping and of actions next to be indicated, it seems probable that only a small percentage of the cement added to concrete is effectively used.

Obviously, it is of the greatest importance that this grouping and isolation of large masses should be prevented. But even if this were quite perfectly done, there remain other actions which militate against thoroughly efficient hydration.

In microscopic examination of concretes, one of the most notable features of the hydrated matrix, aside from the large masses remaining unhydrated, is a "mealy" or speckled appearance. An example of this is shown at 60 diameters in Fig. 16 (concrete from pile caps underwater, Staten Island Ferry, Battery Park, New York). Such a surface is very difficult to photograph and was obtained only by the most delicate polishing. The mealy, or spotty, appearance is here clearly shown, and by careful examination, it can be determined that each of these spots is a cement particle, covered over with a colloidal, or perhaps a colloidal-and-crystalline skin, but remaining quite unhydrated at its center.

The reason for these conditions are made clear by a consideration of the phenomena of hydration as before given, together with the absorption of water by the particle as hydration proceeds and the formation of an impermeable covering by the desiccation of this colloid through abstraction of water from the outer layers by the inner. Further, even with free access of water to the outside of a particle these conditions obtain, for in an agitated mass of cement in spite of the profuse formation of flocculent colloids, an unhydrated center has yet been found in each of the particles examined.

Therefore, it is evident that the finer the grinding, the better will be the hydration, as the finer the particle, the greater its surface in proportion to its bulk and in consequence, the more ready the penetration of reactive water. On the other hand, the finer the particles, the more ready and the closer will be their grouping by surface tension of the mixing water unless means can be found to lower this surface tension,



Fig. 9.

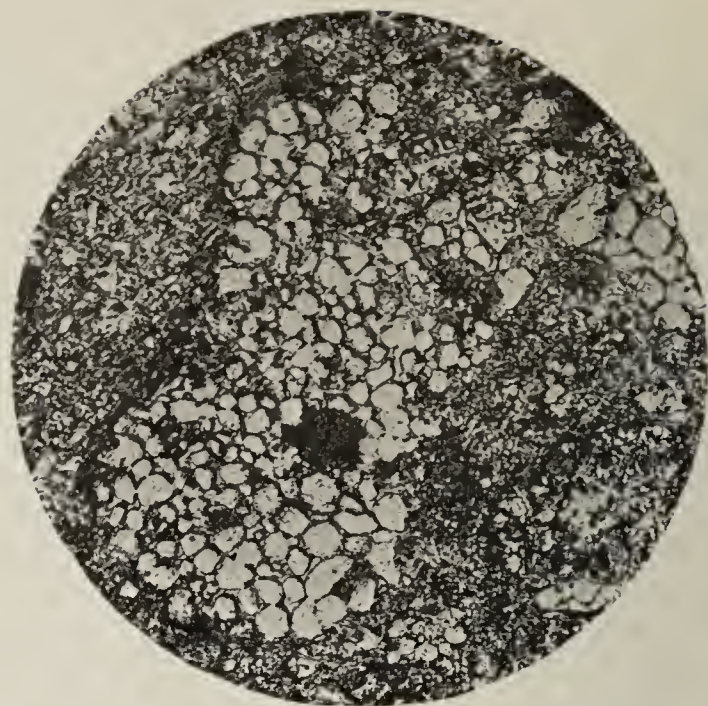


Fig. 12.

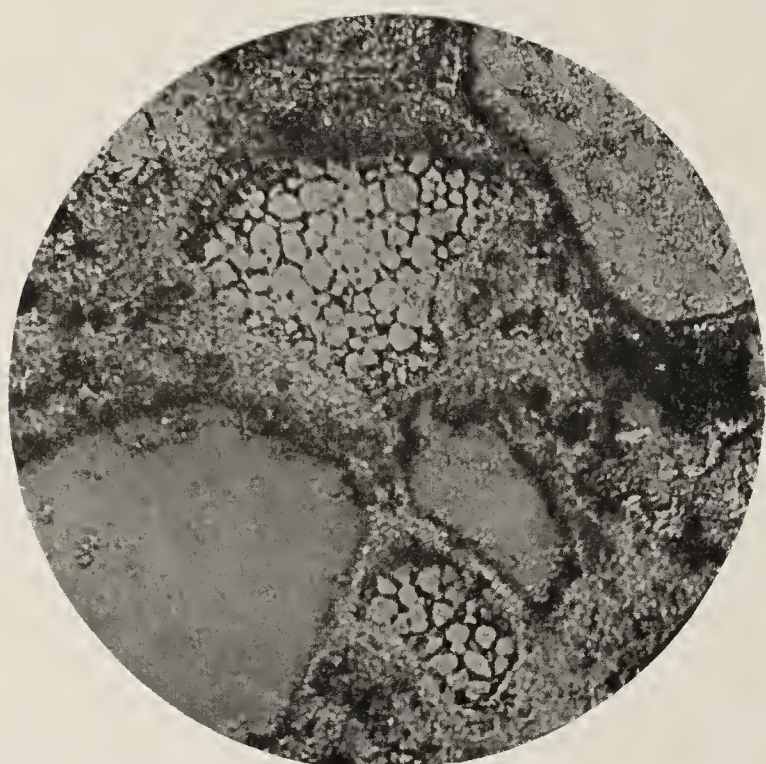


Fig. 10.

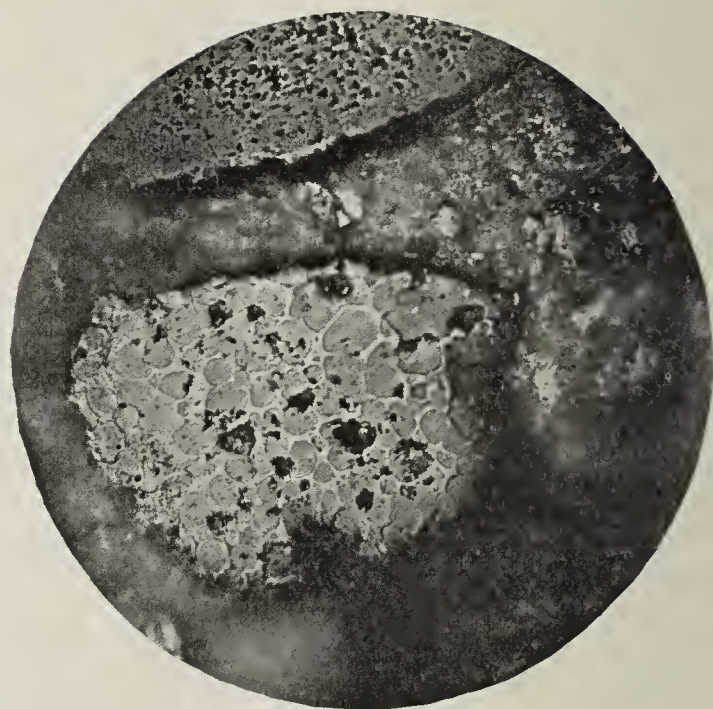


Fig. 13.



Fig. 11.

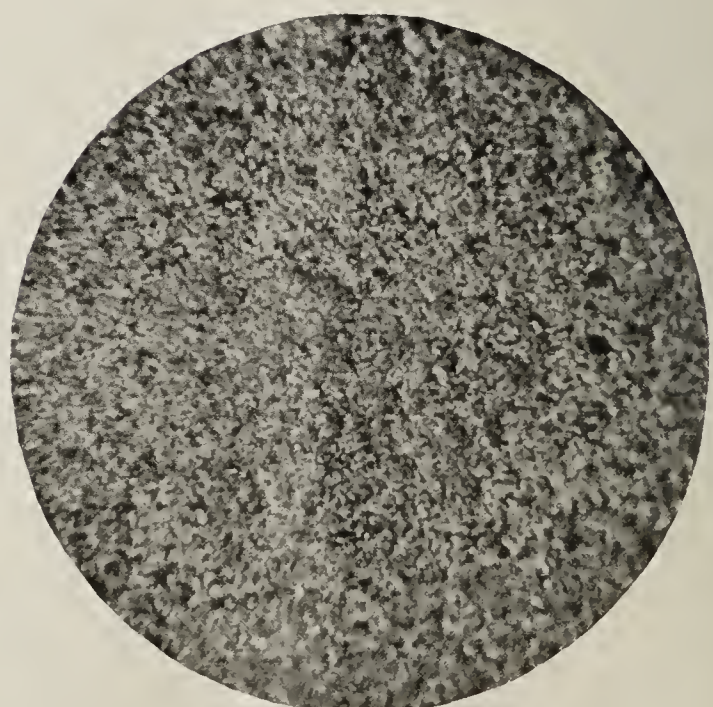


Fig. 14.

without harmfully affecting the quality or the cost of the concrete.

The importance of increasing hydration cannot be exaggerated. Even a slight increase in thickness of hydrated layer results in notable increase in strength. In the earlier, though limited, investigations of this research when cement was delivered by an air-boil, to be met by finely atomized water under the best conditions for union, tensile and compressive strengths rose to high values, with a further peculiarity that the cement showed no retrogression with passage of time. Micro-sections also confirmed physical tests as to the progress of hydration, so that high hopes were entertained for commercial success along similar lines.

But since the conditions revealed by this research have become known and their causes have been ascertained, the next step is the overcoming of objectionable features by removing the causes of their origin. In other words, if high surface tension is at fault, to promote hydration lower that factor to a value which will not be disadvantageous. There are several substances which will lower the surface tension of water. One of these is alcohol, and the effect of additions of alcohol to the mixing water of cement may be readily investigated with the assistance of the microscope.

In Fig. 17 is shown the effect of adding water to this cement. As can readily be seen, the particles have grouped themselves in aggregations of varying size, in formations similar to those found in the examination of set concretes. But if to this water is added a small percentage of alcohol, dispersion immediately results, as in Fig. 18. Although the dispersion here is not complete, the cement is in vastly better situation to be effectively hydrated than it was when closely grouped, before the deflocculent (alcohol) was added.

In commercial work it is of course impracticable to use alcohol in sufficient quantities to properly promote hydration, nor would its use be beneficial to the concrete, because of the excessive liquid content thus made necessary to allow for the evaporation of the alcohol. But there are other agents even more efficient, which are cheap and easy to use and have no objectionable chemical action. So far as experiments have been carried out, these substances promise to produce concrete of greater density and strength than has heretofore been possible.

There are, however, certain other ordinary though important factors in the making of concrete which may be considered briefly. These are: *a* thorough mixing; *b* proper proportioning of aggregates; *c* proper consistency.

To Be Continued



Fig. 16.

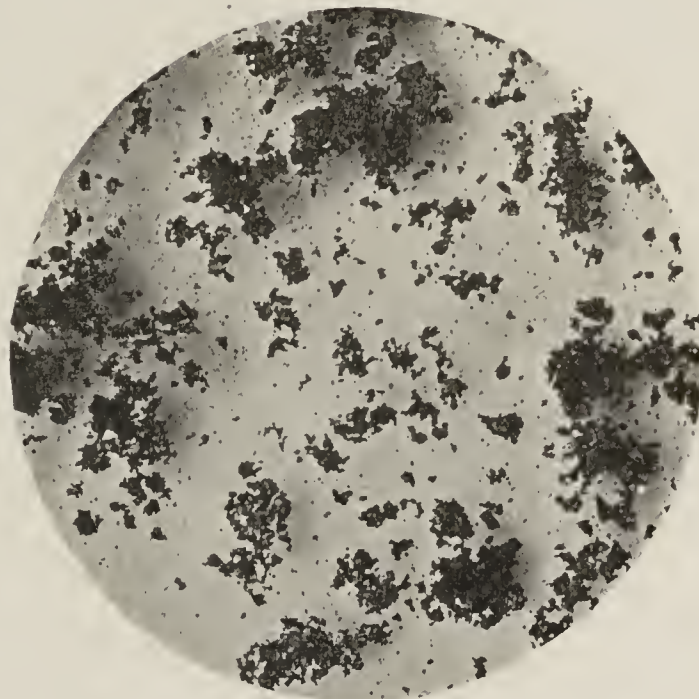


Fig. 17.

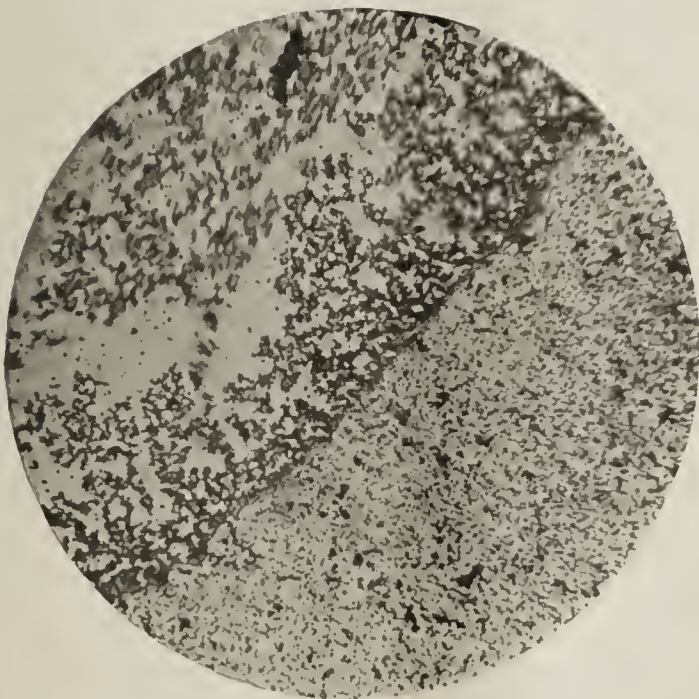


Fig. 15.

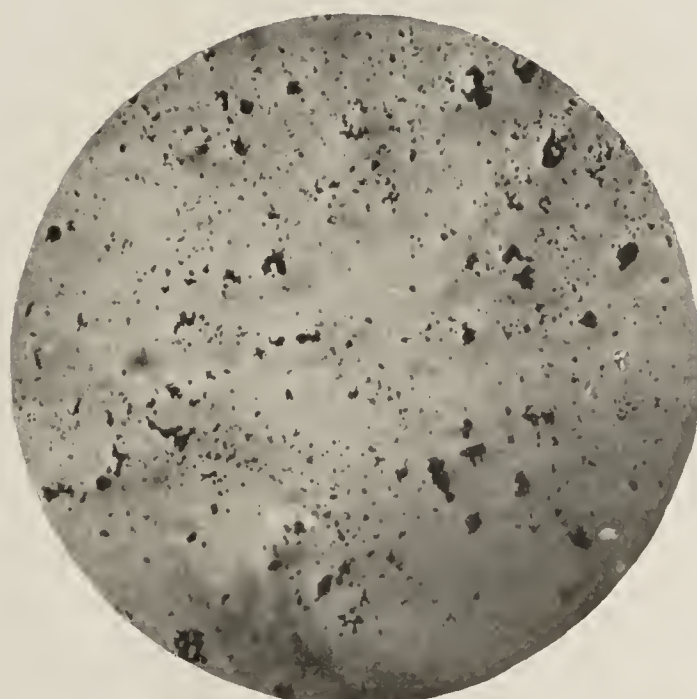


Fig. 18.

CONCRETE PAVING IN NORWOOD, OHIO, AT \$1.20 PER SQUARE YARD

Norwood, Ohio, has laid 2,000 sq. yds. of concrete pavement, 30' wide between curbs. A section of the pavement is shown in an accompanying sketch. One-half inch longitudinal joints are placed at each gutter, and transverse joints every 30': all joints filled with an elastic material, manufactured by The Philip Carey Company, Cincinnati, O. The concrete used was of a mixture of 1:2½:5 cement, sand and crushed boulders. The crushed stone runs from ¾ to 2" in size. With cement at \$1.20 per bbl., and sand at 90c and stone at \$1.20 per yd., the pavement cost \$1.04 per sq. yd., including all items. The pavement was finished by tamping.

Itemized figures of the successful bidder on the work are as follows:

Cinders, \$1.00 per cu. yd.; Concrete, including grading, \$4.75 per cu. yd.; Rolling, 2c per sq. yd.; Concrete curb and gutter, 60c per lin. ft.; Art stone walks, 10c per sq. ft.; Sand, \$1.50 per cu. yd.; 12-in. drain pipe, 75c per lin. ft.; 3-in. drain pipe, 3c per lin. ft.; Catch Basins, \$45.00 each; Outlets, \$40.00 each.

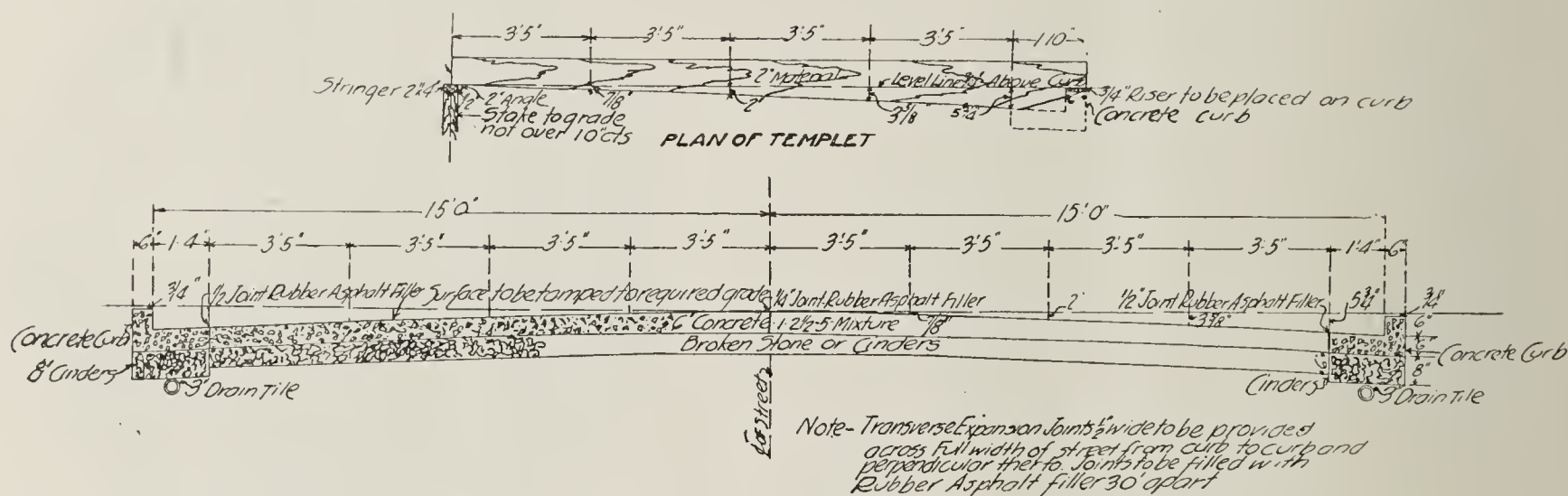
A Milwaukee mixer was used for the greater part of the work and with a force of 15 men, 70 yds. of concrete was laid in a day.

Stallard, general manager of the company. The formal organization of the company was perfected here last year, the manufacture of concrete piping being signalized during July of 1914.

Muscatine has been slow to realize that in the Zeidler concern that city harbors an industry that is already recognized as among Iowa's best concrete plants. One of the secrets of the excellence of the pipe manufactured by the local company is the sand and gravel that is obtained from the Northern Sand and Gravel Company's plant which is located near the Zeidler factory. Sand and gravel are correctly proportioned so that the voids in the concrete are virtually eliminated, resulting in absolute density, according to an explanation advanced by President Zeidler.

Nothing is taken for granted at the Zeidler plant. From four to five grades or sizes of sand and gravel are used in the making of the different kinds of pipe. It has been found that in order to obtain desired results, the grading of sand and gravel has to be varied for the various kinds. It has also been found that there is a correct amount of water to be used. To use too little or too much water has been found to be harmful, say officials of the concern.

Pipe sales are reported to have exceeded the most sanguine expectations during the past season. Ship-



Details of Norwood, Ohio, Paving.

The cost of the pavement as given above includes rolling and sub-grading, and also includes the sand covering.

J. A. Stewart, civil engineer, who was in charge of the work, figures that this cost of \$1.04 is to be considered in comparison with 94c for macadam with tar binder and 80c for water-bound macadam. Fourteen years ago, Mr. Stewart says, Montgomery avenue (the main thoroughfare of Norwood) was improved with concrete curb and gutter and the roadway with macadam. Two and one-half years ago the roadway was paved with granite, but the original concrete curb and gutter were in such good condition that it was not disturbed and today anyone not familiar with the facts would suppose it had been constructed at the same time as the granite pavement.

ZEIDLER CONCRETE PIPE COMPANY

Although in active operation barely a year the Zeidler Concrete Pipe Company, Muscatine, Iowa, is already contemplating the construction of needed additions, according to information learned from officials of that concern.

That the plant will soon have to be enlarged by reason of its remarkable growth since its organization was intimated by John L. Zeidler, president, and L. M.

ments are now being made to points in Iowa, Illinois, Wisconsin and Missouri.

Reinforced concrete culvert pipe is hand made and reinforced by a special method developed by the Zeidler company and protected by patents. Concrete pipe reinforced by this method has a bearing strength far in excess of strength needed in railway and highway culverts. It is also used in storm sewers of large size.

This pipe is made in joints four feet long and internal diameters of 12, 15, 18, 24, 30, 36 and 48 inches. Other sizes are made on request.

Pipe of this kind does not rust or rot out, but improves with age, a condition that does not obtain when culverts are made of other materials. This is of first importance to taxpayers, as the replacement of culverts every few years is a constant drain on the revenue, and should be avoided.

Bell End sewer pipe is made on a machine that has required years of inventive ingenuity and a large amount of money to develop to its present state of perfection. These machines are manufactured by the Pioneer Manufacturing Company, Waterloo, Iowa. These machines will not be sold on the open market, a precaution that they will not fall into unskilled hands, but will be installed at various places and operated by skilled operators. The pipe made on this machine has

no equal, regardless of the material from which it is made. It is perfectly symmetrical, does not vary in any of its dimensions and is so dense that liquids do not penetrate into the walls of the pipe. It has excessive structural strength and constantly improves with age.

Bell End sewer pipe is made in joints and internal diameters of 6, 8, 10, 12, 15, 18, 24 and 30 inches. Specials, such as Y's and T's and bands, are also made.

Drain tile is manufactured in sizes from 4 to 18 inches internal diameter, and like the other products of this plant, is absolutely the best on the market.

ONLY CONCRETE SATISFIES THIS FARMER

There are many well-to-do farmers around Coldwater, Mich. While the sandy Michigan soil is best adapted for fruit, yet by proper methods the soil may be built up so as to give excellent results for general farming. It takes many years to put enough humus into a sandy soil so that it will hold moisture and will not lose its nitrogen during the spring rains, but it is possible, and many of the farmers who have consistently hauled manure from nearby livery stables to their farms and made use of every ounce of fertilizer from their own herds, have built up valuable properties.

O. G. Sherburne bought a small farm within the corporate limits of Coldwater many years ago and by hard work is now the owner of a very rich farm property.

His early buildings were suited to his purse, but in the last few years he has been able to build, according to his ideals, structures that will need no repairs and

The owner plans very soon to raise the barn 10 feet and build a concrete wall all around, giving an additional story at only the cost of raising the walls and building the additional floor. When this is done he will have a conveyor built from the stable to the milk house so that the milk cans can be carried out with the least possible work. The two silos with the concrete chute and feed room cost \$640. The milk house cost \$100.

Mr. Sherburne is not the type of man who spends money for improvements that will not be returned in added profits. He is frank in his criticism of other farmers in his neighborhood who have built such fine barns and equipment that they have no hope of profits for many years to come. But he finds that it is an ultimate saving to build so as to make repairs unnecessary. He does not believe in make-shift construction and his profits in the last few years show that he is making a wise investment in permanent improvements of concrete.

FIREPROOFING MINE SHAFTS

The matter of fireproofing mine shafts is important. In the case of new shafts, the problem is frequently met by all-steel, or steel and concrete, or concrete construction. This does not, however, meet the case of an old timber-lined shaft. To tear out the whole system of shaft timbering and replace it with a fireproof lining would, in many cases, entail too much time and money. Even acknowledging the advantages of concrete, or steel and concrete lining, the cost is often prohibitive and the timber-lined shaft is therefore still the rule. And a timber lining offers many advantages in itself. The lining operations can follow the sinking easily and closely, the units are handled economically and can be quickly adjusted to suit local shaft conditions. If the timber could be made fireproof, therefore, it would be an excellent lining material. A system of fireproofing, permanent, safe and within the cost limit, especially one applicable at any time after sinking is completed, ought to find a large field in the mining industry.

There appears in this issue of the Journal a description of a job in which a cement-gun was used to sheath the wood and steel framing of a steeply inclined shaft in the iron country. The cement-gun has been used for this purpose in other instances also and offers interesting possibilities for underground work. The machine, as is known, is one which deposits cement mortar by an air blast and is peculiar in that the material is mixed dry and no water is added until the material reaches the discharge nozzle. It is claimed that the hydration of the material really takes place in the air between the nozzle and the place of deposit, the initial set of the cement taking place on the structure and not in the mortar box. The nozzle is directed against the work as an ordinary garden hose is used. The layer of cement mortar so deposited has been given the trade name "Gunite." No forms are required for the work. In shaft jobs where timber is to be coated, the wood is first thoroughly cleaned and washed, this work being done with the machine, and then a layer of wire mesh is stretched evenly over the surface and fastened in place at the proper distance therefrom. This reinforcement is provided to take care of the temperature stresses, to give the lining homogeneity and elasticity and to increase the adhesion of the coating to the timber.

It is maintained that this coating is not only fireproof, but also dense and waterproof, thereby preventing the decay of the timber work, since the timbers become waterlogged and much less subject to decay.



Twin Concrete Silos on Mr. Sherburne's Farm, Near Coldwater, Mich., Built with Steel Forms Made by Polk, Genung & Polk Co., Fort Branch, Ind.

will last for generations. He has a splendid barn with concrete floors throughout. He has troughs and tanks of concrete. He has two monolithic concrete silos, the work of one of the best silo contractors in Michigan, Roy C. Angevine, of Coldwater. He has a small building which appears to be a little silo but is really a milk house.

The two silos are 14x40 feet in size, built close together with a concrete chute serving both, and a small concrete walled feed room connected with the barn by a tight door. The feed cart is kept in this room. The silos have concrete roofs and the only wood used for their construction was in the little filling door at the top. The most interesting feature of the farm is the milk house, described in the previous article.

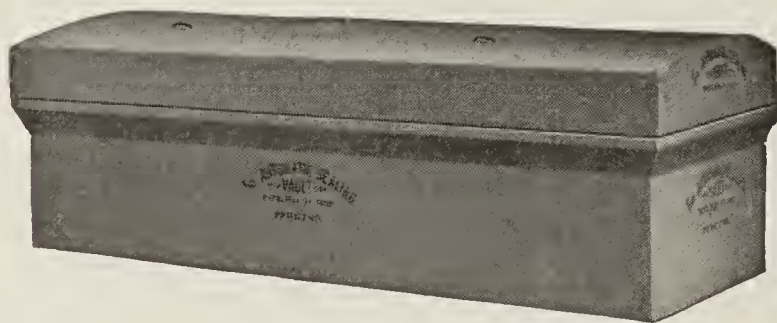
This method of fireproofing was not considered for the job described until the shaft lining itself was completed. If the coating had gone hand-in-hand with the regular lining work, it is claimed by the advocates of the method that the use of the 3-in. lagging between the steel sets could have been obviated by increasing the thickness of the Gunitite and placing it in the form of flat arches between the set members. Only a light lagging strong enough to afford protection during sinking, would have been necessary and this could have been placed outside the steel.

Another shaft which has been fireproofed with Gunitite is the new shaft of the Old Ben Mining Co.'s No. 9 mine near West Frankfort, Ill. This is a vertical coal shaft about 600 feet deep. It is protected by a 2-in. lining, reinforced as described above.

In considering the use of the process, the item of cost is usually the controlling factor. From the very nature of the work, however, it is obviously impossible to name any hard and fast figure which could govern all cases. The Cement Gun Construction Co. states that the price depends so much upon local conditions, material and labor cost, and other details, that it is necessary to make a special estimate for every job. Where compressed air can be furnished by the mine, and under normal conditions, the cost of the Gunitite coating per square foot, it is stated, should be about 20 to 22c. for a 2-in. application and from 15 to 18c. for a 1½-in. thickness. This will include all material, labor, transportation and superintendence, except cage service, which is always furnished by the mine. Under favorable conditions this can be reduced, while in cases where large amounts of water are encountered or where material or labor is high, an increase may be necessary.—[Mining Journal.]

CONCRETE BURIAL VAULT INDUSTRY

The use of concrete burial vaults during the last few years has increased at an astonishing rate, and the next few years will witness even a greater increase in the concrete vault business than has been witnessed during the past. There are a number of reasons for this, among which might be mentioned that the development of the concrete industry has created a demand for concrete products of all kinds—burial vaults included. Then there has never been a period during which the undertaking profession has made as great progress in all of its departments as it has made in



The Automatic Sealing Vault.

Note the smooth finish which is given to it by the machine—no troweling necessary. This vault sells easily on its fine appearance and its very evident strength and prominence. The lid seals onto the body automatically and positively.

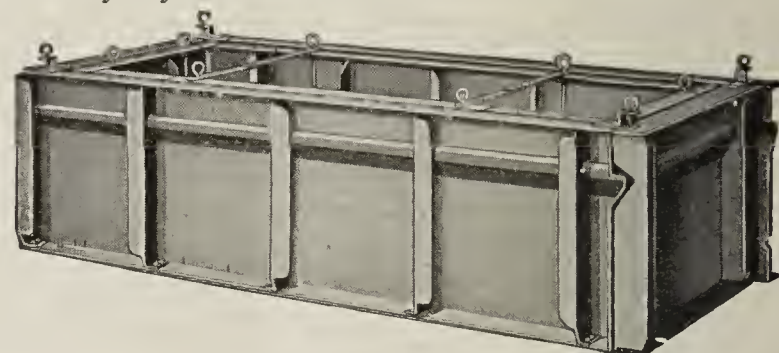
the last ten years, consequently a much higher grade of funeral furnishings of all kinds are being used now than ever before, and therefore there has been an increased demand for a higher state of perfection in burial vaults. Then again, the public in general is being educated out of the old-time method of burying with only an ordinary wooden box to protect the remains, and along with this education has come a spirit of investigation on the part of the people as to what kind of a burial vault is best. The result of all this is

that the concrete vault is more in demand than any other.

The Automatic Sealing Vault Company, 102 East River St., Peru, Ind., has not been slow in realizing the truth of the above statements and has spared neither time nor money in bringing its automatic sealing vault up to the highest standard of perfection.

The Automatic sealing vault is constructed on a plan entirely different from any other concrete vault, as no cementing of any description is necessary to exclude the water. The automatic seal is secured by the simple act of placing the cover in position on the body of the vault, which extends up into the cover in such a manner that when the water in the grave rises to a certain height the air is sealed within the vault, consequently no water can enter, as two bodies cannot occupy the same place at the same time. These facts give the Automatic sealing vault individual characteristics which places it in a class entirely to itself.

Although the Automatic sealing vault has been on the market less than five years, yet they are being sold today by hundreds of undertakers in more than



The Mold for Making the Automatic Sealing Vault.

This machine is adjustable so you can make any required size of vault with it. There isn't a seam or a rivet or a nut on the inside to mar the finished product.

one-third of the states of the Union, and have even found their way into countries outside of the United States and have given universal satisfaction wherever they have been introduced.

One of the principal departments maintained by the Automatic Sealing Vault Company is devoted to the manufacture of adjustable steel molds for the molding of their Automatic sealing vault.

These molds are made of Bessemer sheet steel and are adjustable to fifteen different sizes of vaults, with a capacity of one vault per day. Great care has been exercised in designing these molds. Each section of the molds is made from a single sheet of metal. The manner in which the metal is bent to give the proper shape makes the molds extremely rigid and where extra strength is required the sections are reinforced with angle braces secured in such a manner that all surfaces coming in contact with the cement are free from rivet heads and all other irregularities.

In assembling these molds the different sections are held in position by means of rods and key pins, the use of bolts, nuts, screws, and turnbuckles having been discarded, thus relieving the vault manufacturer of much inconvenience and annoyance.

Any person who is interested in the manufacture of burial vaults will find it to his advantage to write the Automatic Sealing Vault Company, 102 East River St., Peru, Ind.

NEW CEMENT MILL

The Fuller Engineering Company of Allentown, Pa., have just closed a contract for the new 2,000 barrels per day cement plant to be built at Foreman, Ark., for the Consumers Portland Cement Company.

All the latest approved methods of manufacturing will be incorporated, including a complete installation of Fuller Dreadnaught mills.

HAVRE CEMENT WORKS

It is rumored that the Devlin properties near Havre, Montana, have been secured by Dan R. Brown of Spokane, Washington, and Orville A. Miracle of Great Falls, Montana, and that active preparations are being made for the building of a modern mill on the property.

The value of the raw materials have been known for an extended period and the recent development of a large natural gas field at Havre makes a cement plant at that point particularly feasible.

The raw materials consist of a high and low grade limestone that according to the report of engineers, chemists and the United States geologists would produce a high grade cement by a combination of one and twenty-nine hundredth parts of high limestone to one part of low limestone. The limestone contains the requisite amount of iron, alumina and silica—with low magnesia content and could be classed as a cement rock.

A high grade shale adjoins the limestone and a six foot vein of sub-bituminous coal has been developed on the property, besides a claim of twenty acres of mineral ground contains four per cent copper.

The plant would never be handicapped by the failure of gas as were the Kansas mills, through the fact that coal is contained on the property and a number of producing mines in the field insure a fuel supply.

The unusual conditions at Havre make the development of the property very advantageous, particularly the fuel cost of less than five cents per barrel, combined with the economical conditions of quarry and mill operation. Electric power is available from the lines of the Montana Power Company or at a low rate for gas the modern gas engine could be utilized. The engineers that have examined the properties have made very favorable reports, and it is the present plan to proceed with the construction of a twelve hundred barrel mill.

Associated with Messrs. Brown and Miracle in the project are Eastern interests and a number of Montana financiers.

DETERMINING FINENESS OF CEMENT

Three years' experiments devoted to producing a means of determining the exact fineness of cement have resulted at the Bureau of Standards, in the developing of an apparatus which is effective for this purpose.

It is very important to have some means of measuring directly the entire state of subdivision of cement; in other words, to discover just what percentage of the material is made up of particles of certain definite sizes. If such a division can be made, it should be possible not only to compare the efficiency of different grinders, but also to determine what degree of fineness must be attained before the cement becomes "hydraulically active"—that is, capable of combining with water to form the binding material in mortar and concrete.

The apparatus devised by the Bureau of Standards consists of a vertical brass pipe, about 3 inches in diameter and 5 feet long, at the lower end of which is attached a glass bulb in which the cement to be tested is placed. Air at constant pressure is blown into the cement through a glass tube or nozzle in the side of the bulb, and as the air can escape only through the vertical stack it carries with it the cement dust, which is caught in a flannel hood surmounting the stack. The air flow in the stack is very uniform, and in a short time all the dust will be removed from the cement, leaving a granular residue in the glass bulb. This residue is weighed and the amount of dust is determined by subtracting the weight of the residue from

that of the original sample of cement. Different grades are obtained by using different-sized nozzles, and thus a number of separations can be made in the very fine portion of the cement. With the aid of the microscope the size of the largest particles in any given separation can be readily determined, and in this manner the apparatus is standardized without reference to the size of the nozzles and other parts of the apparatus or the air pressure used.

It is found that the cement "flour"—that is, the portion of cement which contains no perceptible grit when rubbed between the fingers—consists of particles less than 0.0007 inch in diameter. The apparatus is called the air analyzer, and may be used for separating and grading any hard-grained materials, such as ground quartz, emery and other abrasives. The air analyzer in modified form is also capable of separating many other powders, for example, paint pigments, plasters, clays and similar materials.

Copies of Technologic Paper No. 48, the publication upon this subject, may be obtained, without charge, upon application to the Bureau of Standards, Washington, D. C.

CEMENT QUARRY FLOODED.

Manager Charles A. Porter, of the Lawrence Portland Cement Company, is busy assembling all the pumps he can get together to pump out the 400-foot quarry, flooded during the recent storms, when the dam erected to divert the course of Hokendauqua creek broke on account of flood pressure. The swollen stream quickly filled the quarry, and it is estimated it contains 10,000,000 gallons of water.

USES OF PORTLAND CEMENT

In a paper on the "Uses and Abuses of Portland Cement," read at the convention of the Indiana Engineering Society, J. Edward Cassidy, Philadelphia, said:

"Owing to its great range of adaptability, there is practically no class of construction into which cement may not enter, and this fact is fully verified by thousands of buildings, bridges, dams, roads, aqueducts, sewers, breakwaters and numerous other classes of structures.

"During the earlier days of development of the use of Portland cement, the composition of aggregates was not as well understood as it is at present, and even with the definite knowledge available on the subject, this feature does not receive the careful attention it should in a great many instances.

"During the last decade refinements have been made in the manufacture of steel, and it has been possible to establish new calculations for reinforced concrete work. Refinements have also been made in the chemical composition of cement, and today the manufacture of Portland cement may be said to be standardized. For a considerable number of years after the use of Portland cement had become general, definite knowledge of the action of the cement in concrete was limited, and a majority of the users of cement did not differentiate between setting and hardening, with decidedly disastrous results in many cases. Many users of cement demand a quick setting cement when they really want a quick hardening cement, or a cement that will show the greatest strength values in the shortest length of time. If it were generally known that cement which shows a quick final set develops far less strength in short periods than a slow setting or a normal setting cement, architects, engineers and contractors would refrain from demanding quick setting cements. The action of setting, in itself, does not result in strength to any appreciable degree, as

the strength of the concrete results entirely from hardening.

"Relative to the setting and hardening of Portland cements, the following conclusions are derived from the standard work of H. Le Chatelier, whose thesis on the Constitution of Cements, published in 1887, was a classic on the chemistry of Portland cements, and which has been confirmed and amplified by later investigations.

"1. That calcined Portland cements are formed essentially of a calcium silicate, which is the active element of hardening, and that the compound is produced by chemical precipitation in the midst of a molten double silicate, which has acted as a vehicle for silica and lime to allow them to combine, but which remains sensibly neutral during their hardening."

"2. That the fundamental reaction which brings about the hardening is the splitting up of a basic calcium silicate into mono-calcium silicate and calcium hydrate.

"3. That while it is difficult to differentiate between setting and hardening chemically, the matter is decidedly important from a practical standpoint.

"4. 'The setting is perhaps only the beginning of hardening; it is characterized by a progressive diminution in the fluidity of the mortars; it begins to manifest itself by the persistency of breaks of continuity; the voids produced artificially in the paste, which do not close up again under the influence of gravity or capillarity.'

"The chemical reactions which accompany the setting may be different from those which continue to occur during hardening, but it is not always so.

"Numerous circumstances and elements of quality tend to vary the setting process; 'the fineness of cement, depending on the process of grinding and bolting, the porosity of the grains of cement calcined at a low temperature, the notable proportions of aluminates and ferrites giving quicker and quicker cements.'

"5. 'The hardening, properly so called, is occasioned almost exclusively by the slow and progressive hydration of calcium silicate, which, after having begun during the setting, continues entirely alone.'

"While the hardness of hydraulic mortars depends on the cohesion of the crystallized compounds and their adherence to each other or to a foreign inert substance, adhesion depends mainly on:

"(a) Nature of bodies in contact and relative direction of faces in contact, in case of crystallized bodies.

"(b) The extent of surfaces in contact and upon the chemical nature and condition of surfaces of bodies present.

"6. Le Chatelier demonstrated that the crystals formed in hydraulic cements take the form of hexagonal plates, the angles of the plates being 60 degrees, which would indicate a definite natural law regarding the formation of crystals; and he also assumed the fact that the spacing of the crystals is governed by a definite law. In case of hydraulic mortars, if all voids were filled and the cement uniformly distributed in the mass, the crystals governed by their law of formation would form a perfect contact with each other and with bodies with which they come in contact, and adherence would be at a maximum.

"While the aggregate in concrete may have all the properties for combining with the cement to produce a strong concrete; yet the presence of clay or other foreign substances on the surfaces of the stone or gravel will prevent the crystals of the cement from coming in intimate contact with the surface proper, and the strength that would result from adhesion will be lost. A large percentage of clay or other foreign substance having no strength values will not only prevent the crystals from adhering to the solid bodies

of the aggregate, but will prevent the crystals from adhering to each other, which results in a weak concrete whose strength values are problematical. Not a few failures in concrete construction have resulted from this cause.

"The exact time that elapses between the first set of cement and the completion of the hardening process is variable, and may cover a period of a year or more. It is also known that during the hardening period there is a time when the action of hardening may be suspended, but after the period of 'fatigue' has passed, the process will continue until completion. During this period of 'fatigue,' the strength of the concrete will remain stationary or even lose in strength, but as this action does not affect the stability or the ultimate strength of the concrete, it is of little consequence.

"Failures are almost invariably due to the abuse of cement in concrete construction. We have provided a Society for the Prevention of Cruelty to Animals to take care of the man who abuses his horse because it cannot pull a four-horse load, but the man who tries to make one barrel of cement do the work of four barrels, with disastrous results to both persons and property, goes merrily on his way. The man who mixes his concrete in the proportions of one part of cement to fifteen parts of aggregate, and the man who uses disintegrated sand with a large percentage of loam, to make their concrete, will have tablets placed to their memory in the 'hall of fame' by the side of the man who rocked the boat and the man who was sure the gun was not loaded.

"The writer has made personal investigations of the majority of concrete failures of note occurring in the United States during the past fifteen years, in addition to studying the reports of other investigators, and while it has appeared in some cases that the failures have been due to improper designs, the large majority of causes of failure have been from the use of poor aggregates, wrong proportions, improper mixing, and the removal of forms before the concrete has hardened sufficiently to carry the dead loads or loads superimposed on the green concrete.

"In a number of cases investigated by the writer where improper mixtures were being used, it was found that the fault was due to a wrong impression on the part of the foremen as to the interpretation of the 'parts' of a designated mixture. For instance, one case called for a 1:2:4 mix, and the foreman based his measurements on wheelbarrows that were found to hold $2\frac{1}{2}$ cubic feet. One bag of cement, or approximately one cubic foot, was dumped in a wheelbarrow and classed as the equivalent of one wheelbarrow of sand or gravel, and the mix was carried through on that basis. While the foreman had the impression he was complying with the specifications and getting a 1:2:4 mix, he was, in reality, getting a 1:5:10 mixture. Competent supervision, which was lacking, would have eliminated the failure that was bound to occur.

"In a case where failure resulted in a new reinforced concrete building constructed on the site of a building that had been burned, an examination of the concrete revealed the fact that the concrete was impregnated with scraps of burned iron, cinders and charred wood.

"Concrete failures are uncalled for and can be entirely eliminated when the work is designed by competent engineers and architects, and carried out under competent superintendence. Lack of knowledge or experience on the part of the contractor should not be an excuse for poor work that does or does not result in failure, as it is the duty of the engineer and architect to see that there is a competent superintendent on the work at all times who will see that the plans and specifications are properly carried out."

A NEW SAFETY DETONATING FUSE.

Eliminates Misfires In Blasting and Promotes Safety.

Prior to the introduction of the detonating fuse described herein, the management of the Cornwall iron mines, Cornwall, Pa., had experienced much trouble, common to deep-hole blasting in open-cut mines or quarries, from misfires, and had made many experiments to determine the best and safest method of blasting. In January of this year the management was invited to witness a trial blast with "Cordeau-

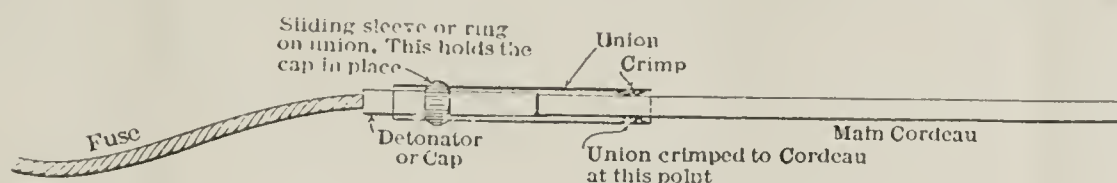


FIG. 1. METHOD OF ATTACHING DETONATOR TO CORDEAU

Bickford" at the quarries of the Atlas Portland Cement Co. at Northampton, Pa., the results of which were so satisfactory that an immediate trial order was placed for blasting down ore benches. This was the first application of the fuse for ore mining.

The trial proved the wonderful adaptability of the fuse to the purpose, and the simplicity and safety in handling brought a sense of relief and satisfaction. We, therefore, immediately adopted it for use in all deep-hole blasting and stopped the use of the ordinary electric fuse except in shallow holes.

This new detonator is a French invention, known as Cordeau detonant or detonating fuse, and is sold under the name of Cordeau-Bickford. It consists of a lead tube 5 to 6 millimeters in diameter, filled with trinitrotoluene.

In addition to greatly increasing the safety of blasting, the detonating fuse has the additional merit of increasing the efficiency of the explosive charge.

To summarize, we may state that this fuse has three very important qualities, viz.: 1. It is safe. 2. It is instantaneous. 3. It increases the efficiency of an explosive charge.

1. Safety.—There is no danger in the handling or storage of the fuse. It cannot be exploded by friction, fire, or ordinary shock. It requires the use of a strong blasting cap properly attached to explode it. In blasting charged holes, the cap or exploder can be applied outside the hole, thus avoiding the danger of burned powder caused by side spit from ordinary fuse; also any risk of accident while tamping and the risk from a portion of an unexploded charge accompanied by a cap remaining in the debris from a blast is entirely obviated.

2. Speed.—The average rate of speed of this fuse is estimated to be close to 17,000 feet per second, so that when it is used the explosive charge is detonated instantly throughout its entire length, instead of at one point as is the case with the blasting cap or electric exploder.

3. Efficiency.—It is known that the speed of an explosive decreases as the explosive wave travels away from the detonator. That the powder in a hole has the strongest explosive effect around the exploder is evident from an examination of the face of the bank after a shot. This can be demonstrated also by placing sticks of dynamite on the ground end for end, about 6 inches apart, with the cap in the first stick. The explosive force gradually lessens until it finally ceases to progress, leaving the farthest sticks unexploded.

By using this fuse the charge is detonated instantaneously throughout its entire length. This results in a saving of about 10 per cent of explosives as determined by results obtained at Cornwall and else-

where. It is not affected by heat, cold, or moisture, and lasts indefinitely without deterioration.

Figure 1 illustrates the method of attaching the detonator to the fuse. Either ordinary fuse and cap or an electric exploder can be used to set off the detonating fuse.

Figure 2 shows the method of making connections between main and branch lines. Branch line A is joined to trunk line B by twisting the split ends, one to the right, the other to the left of the intersection. These joints may be protected from danger of loosening or breaking by winding with electric tape. This

also protects them from moisture. This precaution is not necessary except where many connections have to be made or wet work is encountered. If the direction of the explosive wave is carefully borne in mind, there can be as many branches and sub-branches as are desired.

On very large and important work where more than one man is employed, these mains may be joined together as a measure of precaution. This is done by cutting the mains and putting caps on the ends and then uniting them again by means of a brass sleeve, the ends of which are firmly crimped to the detonating fuse. Around these brass sleeves the ends of the con-

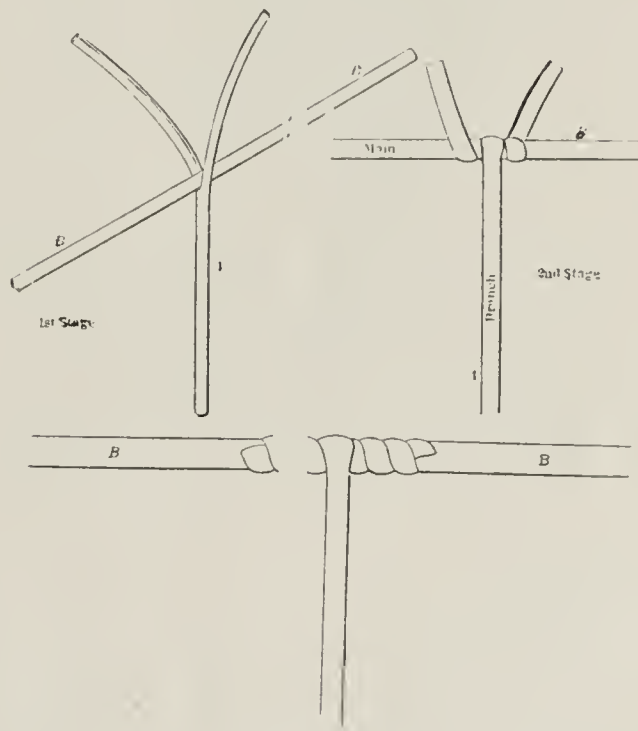


FIG. 2 CONNECTIONS FOR MAIN LINE AND BRANCHES

necting line are wound in exactly the same manner as when attaching a branch to a main line.

In the test at the quarries of the Atlas Portland Cement Co., the rock blasted was a cement limestone shale bench 94 feet high (perpendicular) with the bottom well cleaned up. There were eleven 5-inch diameter holes, 26 feet back from the face of the bench and spaced 13 feet apart, 100 feet deep and extending 6 feet below the bottom of the bench. The holes were cleared of water just before loading. The charge was made up of 50 per cent gelatin and 40 per cent low-freezing dynamite, with the detonating fuse, 6 millimeters in diameter, running to the bottom of each hole.

All the holes were connected with a line of detonating fuse to the end of which a single No. 6 detonating cap was attached. This was fired by a 220-volt cur-

rent from a live wire. Instantly there was a sharp crack as the fuse exploded, followed by a rumble of the crumbling bank. The rock was thrown well out, leaving a clean wall or face.

CONCRETE ORNAMENTAL MOULDS

Never before in the history of concrete work has the use of concrete been so great for ornamental purposes as at the present time. There seems to be no limit to the possibilities in this line and concrete lends itself so readily to the manufacture of ornamental articles that it proves most attractive and a very interesting line of work. There is a satisfaction about turning out a handsome piece of work that appeals to every concrete worker, and the profits in this line are also very satisfactory. You can make a vase similar to the following illustration with about one sack of cement. This vase would sell for not less than \$5.00 and every house-wife wants a pair of these as soon as she sees them. This illustration shows one of the most attractive and beautiful lawn vases on the market at the



present time. It is sold by the Lansing-Company, Lansing, Mich., who are extensive manufacturers of concrete machinery of every description and their catalog No. 3540, shows the largest line of ornamental moulds made. It will pay contractors to have a copy of this book if for nothing else than for reference. It describes everything shown in the concrete machinery line and gives much valuable information of every description. All moulds for ornamental purposes, are all made in four sections and are hinged so as to draw easily from the finished mould. The designs are clear cut and attractive in appearance and every contractor will do well to consider the establishment of an ornamental department in connection with their regular business. Every article produced will prove an advertisement for their work and every live, up-to-date, concrete man realizes that they cannot do business without advertising. There are a hundred and one different ways in which articles of this kind tend to bring added sales to their business, and will increase their profits to a large extent, and put their business on a more satisfactory and profitable basis. Write the Lansing Company, Lansing, Mich., for a copy of their catalog, No. 3540.

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"MODERN SILAGE METHODS"

The tenth edition of the 256-page book, "Modern Silage Methods," has just been issued by the Silver Manufacturing Company, 397 Broadway, Salem, Ohio. This is an extremely practical book on silos, covering their construction, process of filling, silage and its composition, proper feeding of silage—in all, a complete guide for silo builders, and for feeders and dairymen. The chapters devoted to silo construction are very complete, going fully into details, and clearly illustrated with working drawings. All of the recognized types of silo construction are covered. The Silver Manufacturing Company offer a line of silo filling machines, and a few pages of this book are given over to illustrated descriptions of these machines. The book itself, however, is a thorough text book regarding silos and silage, issued for the instruction of silo builders and farmers. A small charge is made to cover postage. Write the Silver Manufacturing Company for a copy of this book.

HENDRICKS' COMMERCIAL REGISTER.

A volume of great interest and importance to contractors, manufacturers of machinery and equipment, and to anyone who uses machinery and equipment of any type is "Hendricks' Commercial Register of the United States." The twenty-fourth annual edition of this register has just come off the press.

This new edition has been thoroughly revised, name for name, from cover to cover. Deadwood and useless material has been eliminated and much new information of a kind useful to buyers and sellers has been added, making it a better work in every way than in the past.

The volume, which contains over 1,500 large pages, has been entirely reset in clean, new type. It has been bound, this year, in handsome red leather instead of cloth, as formerly. The general plan of the volume, however, with its comprehensive index and convenient classifications, remains the same as in the past.

AWARDED GRAND PRIZE

The Austin-Western Road Machinery Company exhibit at the Panama-Pacific Exposition has been awarded the grand prize for the collective exhibit. This is the only grand prize for road machinery offered in the Exposition and is a distinctive honor.

In addition to this special grand prize, medals of honor have been awarded to the Austin and Western elevating graders, Austin gyratory crushers, Austin motor rollers, Austin street sprinklers and sweepers, and Austin combined sprinkler and sweeper. Gold medals were awarded to the company's dump cars, jaw crushers, ditching machines, road graders, plows, reversible horse rollers, street oilers and motor lawn mowers. A total of 16 prizes was received: the special grand prize and 15 medals.

FULLER-LEHIGH PULVERIZER MILL

Catalogue No. 70 of the Lehigh Car, Wheel & Axle Works describes and illustrates in detail the Fuller-Lehigh Pulverizer Mill extensively used as fine grinder in cement plants, mining enterprises, chemical works and coal grinding plants. Numerous cuts show installations of the mill at cement plants, where they can be found in batteries of twenties and fifties in the case of the larger plants. The mill has given good satisfaction ever since it was put on the market and by this time has withstood the test of many years. Grinding qualities, power requirement and economical operation made this mill a successful competitor of former types of grinding machinery.

HALL INTERLOCKING CONCRETE CULVERTS

That the proper drainage of a road is one of the most important parts of road improvement is generally recognized. The carrying out of any good roads project consequently involves the construction of a number of culverts. For this purpose, concrete has become known as a material for building a permanent culvert. The disadvantages of its use have been the necessity for hauling in materials to the work, the closing of the road until the concrete had set, and the expense of moving forms, mixers and crews from place to place.

A solution of these difficulties is offered by the Hall interlocking concrete culvert, which promises to open a rich field to concrete contractors. These culverts were first tested out in the mountain regions of Montana, where they were exposed to severe tests as to alkaline soil, extremely low temperatures, eroding mountain streams and heavy freighting traffic.

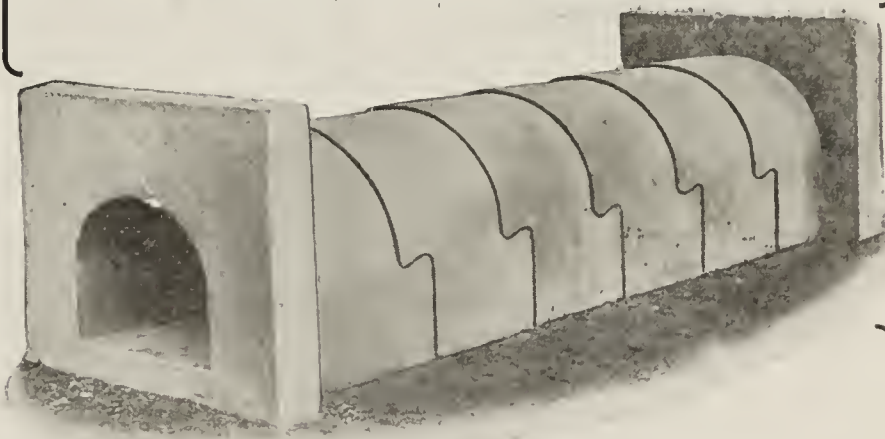
These culverts are made in sizes from 12 to 48 inches in diameter, in sections 18 inches in length. They are made in concrete plants in various localities and are transported to the place of use, where a complete culvert can be installed by unskilled labor in a few hours without blocking the road to traffic. Five sections are molded at one time, the "wet-mix process" being used. No iron or other perishable material is used in joining the sections.

As will readily be seen, such a culvert possesses many advantages. It is of reinforced concrete, designed to resist heavy loads. It is economical, as there is no waste of material and the same forms are repeatedly used. The fact that the road can immediately be opened for traffic is another strong point in its favor.

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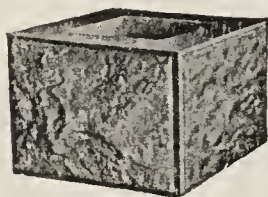
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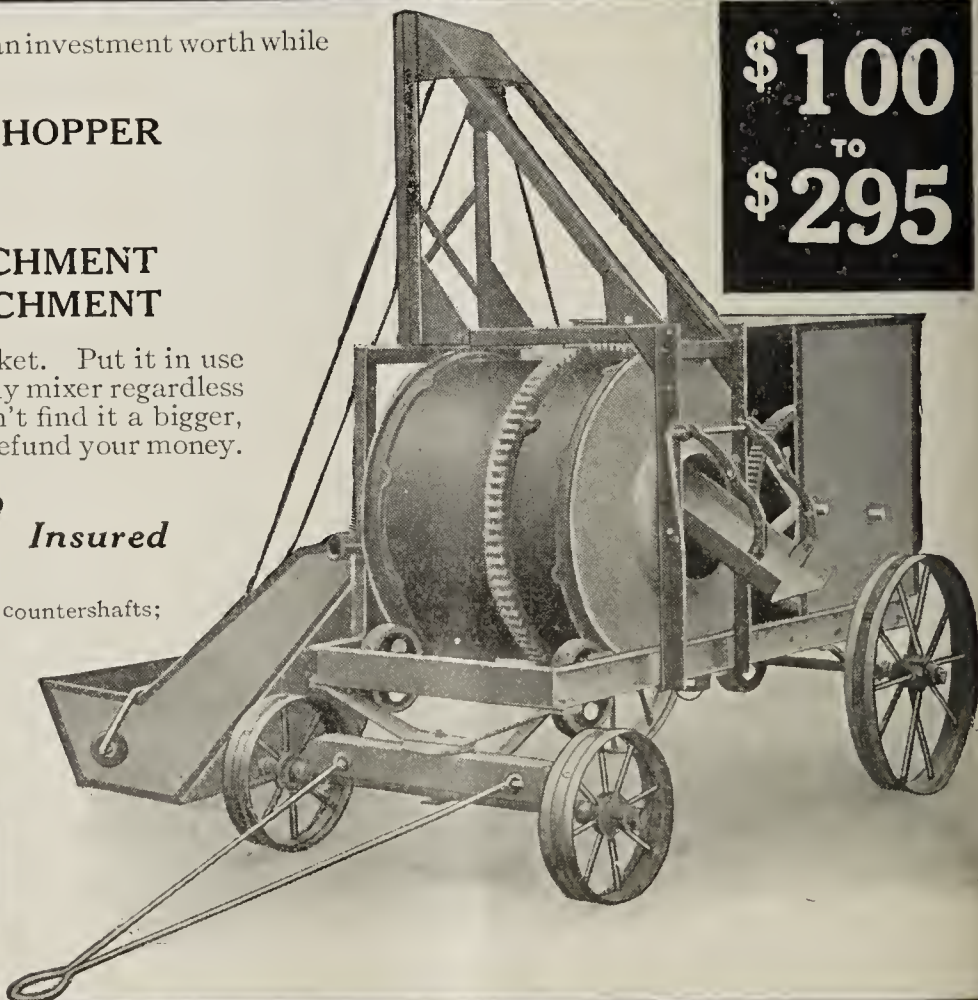
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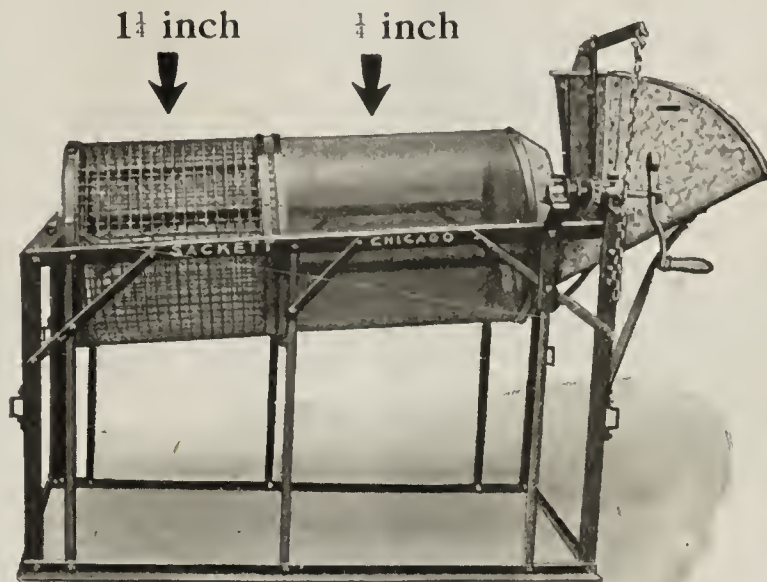
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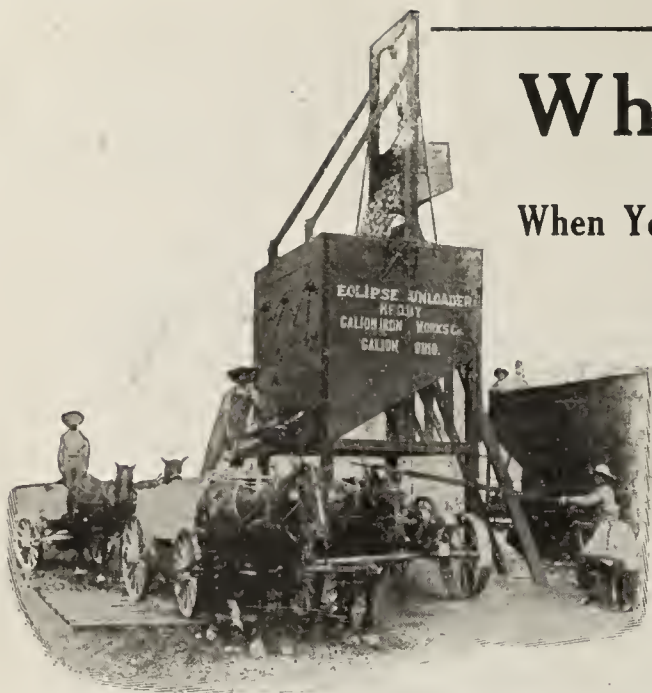
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When You Can Unload Material from Cars to Trucks with an Eclipse Unloader at a Cost of 2c a Yard

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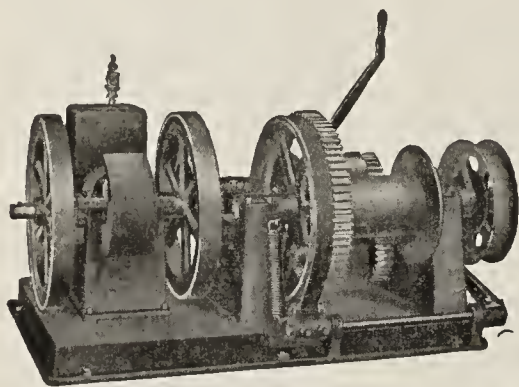
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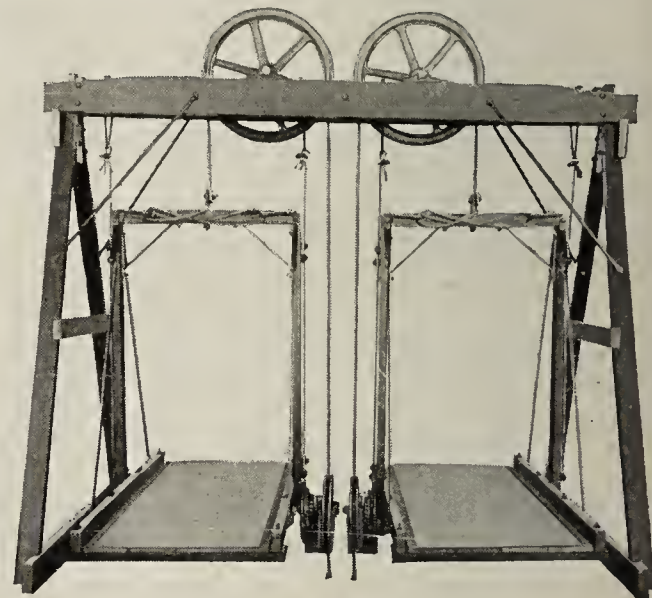
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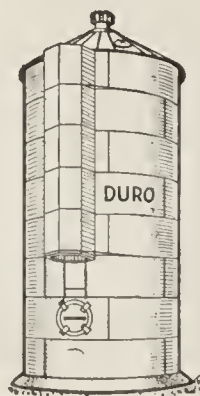
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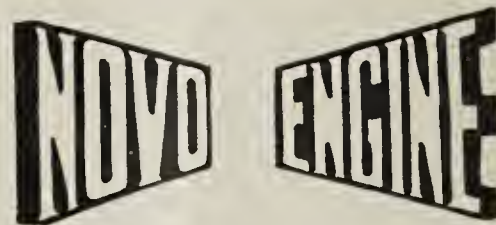


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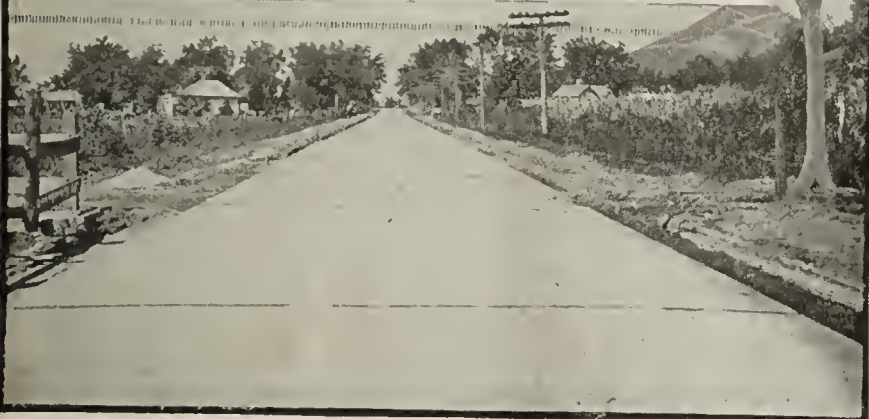
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Because they are uniform throughout, economical to lay, unaffected by climatic conditions, and

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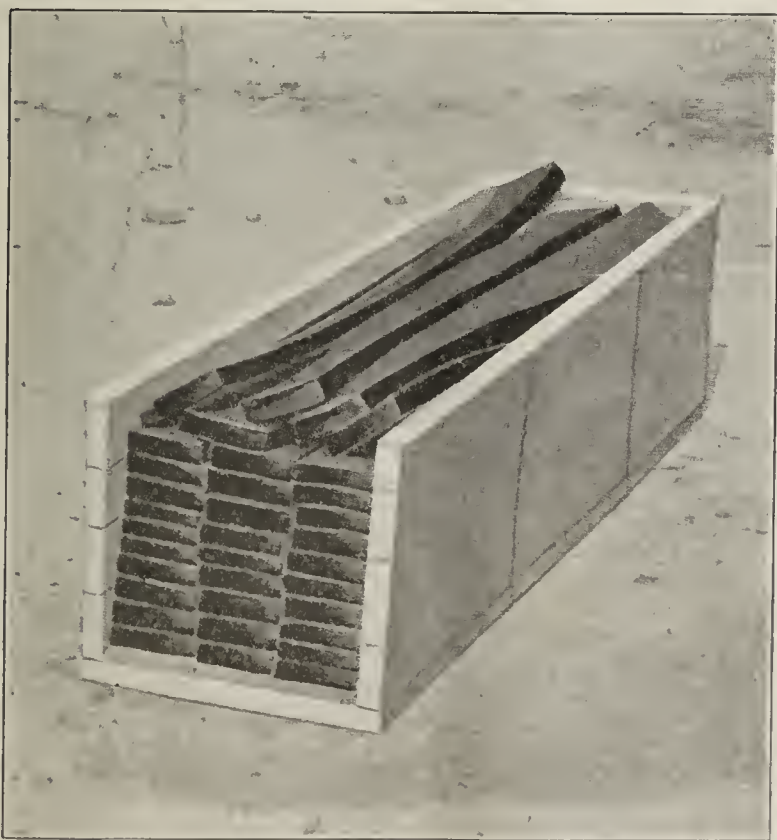
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1

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2



HIRAM WONDERS HOW SMITH MANAGES WITH FEWER EMPLOYEES, YET DOES MORE BUSINESS. HE GETS THE IDEA BY STUDYING SMITH'S METHODS.



3



4

ON HIS WAY BACK TO HIS OFFICE HE RESOLVES TO INVESTIGATE THE DIFFERENT MIXERS. HE LOOKS THROUGH HIS TRADING PAPERS AND WRITES FOR CATALOGS ON THE MIXERS THAT APPEAR SUITABLE FOR HIS PURPOSE.

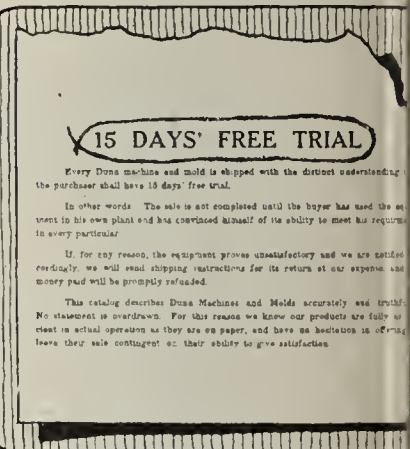


HE GETS THE CATALOGS AND FINDS THAT PRICES VARY FROM \$33.50 TO \$485.00. BUT AS EACH MANUFACTURER CLAIMS HIS MIXER BEST, IT'S UP TO HIRAM TO FIND OUT FOR HIMSELF.

5

AN ANNOUNCEMENT IN THE DUNN CATALOG ATTRACTS HIS ATTENTION; IT READS: "USE THE DUNN MIXER ON YOUR OWN WORK FOR 15 DAYS. THEN, IF SATISFACTORY, KEEP IT; IF NOT, RETURN IT. NO COST, NO OBLIGATION."

6



HIRAM CONSIDERS THIS THE FAIREST OFFER YET MADE, AND AS THE DUNN MIXER SEEMS TO BE SATISFACTORY IN EVERY OTHER WAY, HE FILLS OUT THE ORDER BLANK ENCLOSED IN THE CATALOG AND MAILED IT.



7



8

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THE MIXER HAS BEEN IN USE A WEEK, AND THE OPERATOR IS ENTHUSIASTIC. HE EXPLAINS TO HIRAM HOW THE LONG DRUM AND FOUR MIXING BLADES MEAN EFFICIENCY, AND THAT THE POWER DISCHARGE FEATURE SAVES LABOR "BEST MIXER I EVER SAW"

9

AT THE END OF 15 DAYS THE FOREMAN REPORTS THE DUNN MIXER HAS SAVED \$47.73 IN SALARIES, AND HAS BEEN TRIED OUT ON A NUMBER OF DIFFERENT JOBS WITH PERFECT SATISFACTION.

10



HIRAM DOES THE ONLY THING POSSIBLE UNDER THE CIRCUMSTANCES, AND NOTIFIES THE MANUFACTURERS THAT HE'LL KEEP THE DUNN MIXER. HE NOW REALIZES THAT MONEY SAVING EQUIPMENT IS ALWAYS AN INVESTMENT.



11



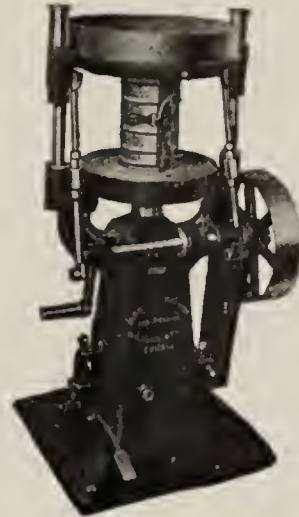
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Pat's Nos. 842262 and 782700



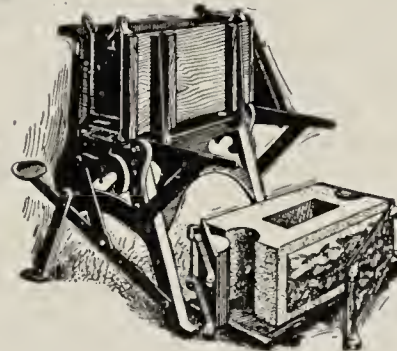
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Make four or ten reinforced concrete fence posts at a time. Assure a higher quality post at a lower cost of manufacture. Prices of 4-mold battery, \$12.50, other prices in post mold catalog—get a copy. All molds sold on 15 days' trial.



Dunn Vase Molds

Price \$15.00. Makes the artistic vases as shown (which retail at \$8.00) for \$1.50. Other Dunn molds for making concrete porches, chimneys, posts, piers, flower boxes, etc., completely described in Ornamental mold catalog, get a copy. All molds sold on 15 days' trial.



Dunn Block Machine

Instantly adjustable for making Side Face, Face Down, or Two-Piece Wall blocks. Special off-bearing system prevents damage to wet blocks. Use a wet mixture and require little tamping. Capacity, 150 blocks daily. Sold on 15 days' trial. Price.... **\$40**

Satisfaction First, Last and Always

is what we have given customers since we started business. We ship any of our machines or molds on 15 days' trial so that satisfaction is predetermined before we receive a cent. You "play safe" when you buy from Dunn.

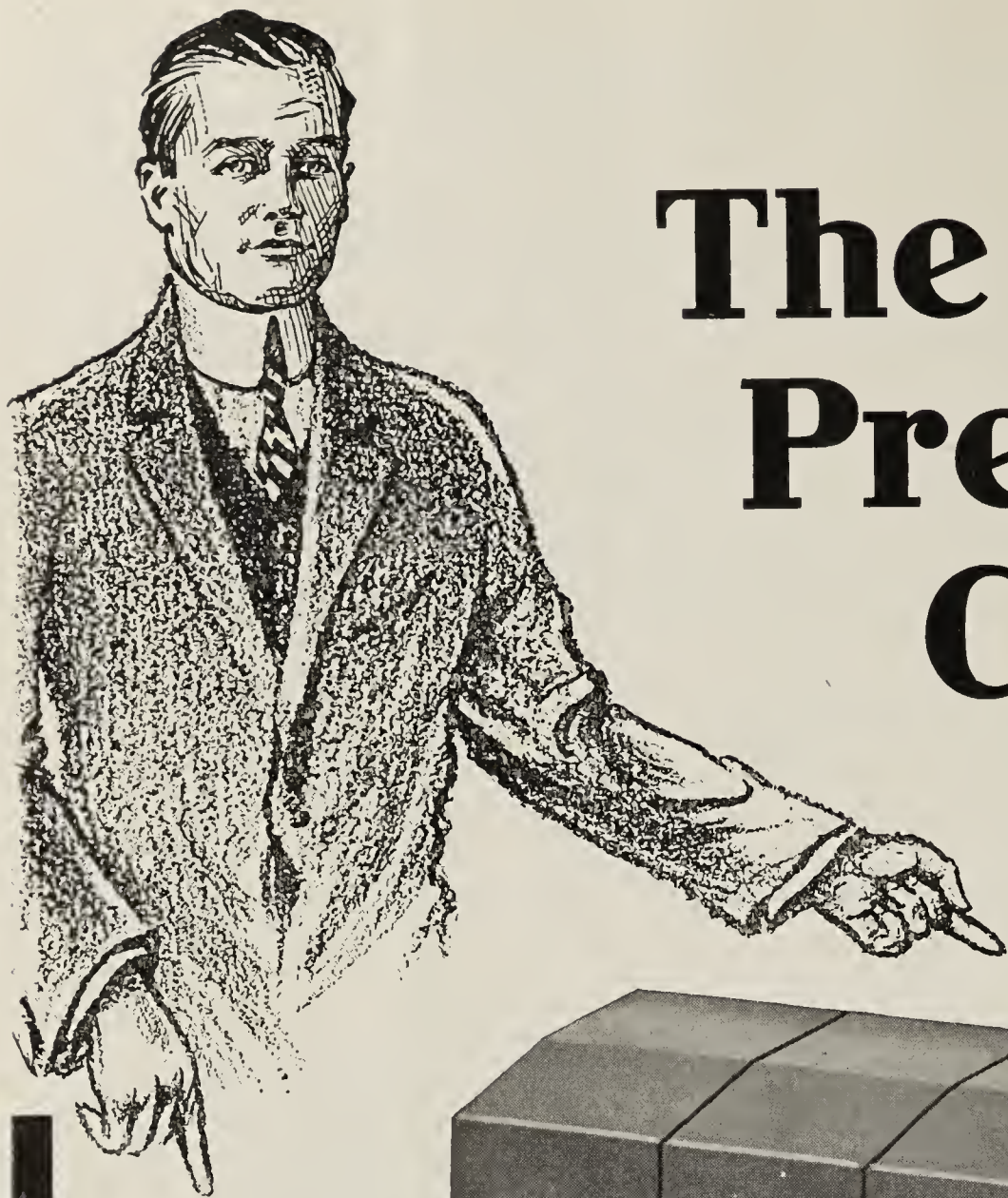


W. E. Dunn Mfg. Co.

4139 Fillmore St.,

Chicago

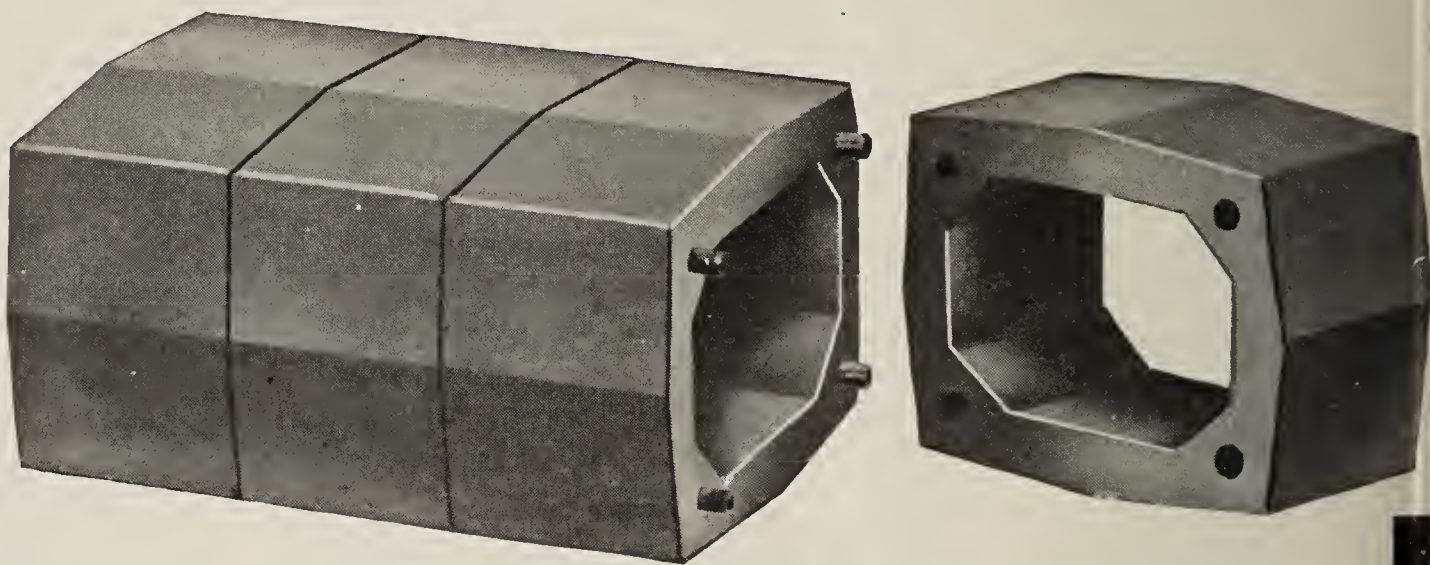




The Security Premolded Culvert

An Effective, Permanent and Economical Culvert

Where Concrete Material Is Available These SECURITY Culvert Units Can Be Made Under Our System for Less Cost Than Temporary Culverts.



THE use of premolded units of reinforced concrete for road, railroad and other culvert work is becoming more popular, due essentially to the economy and the exceedingly satisfactory results attained by their use.

The Security Premolded Culvert is the only sectional, premolded, reinforced concrete culvert now on the market that fills all the necessary requirements of a well designed type of culvert.

The units of the Security Culvert can be molded anywhere conditions permit, on the job, in your plant, or placed out on contract

with some concrete products manufacturer. These units can be shipped, like blocks, staves or tile, to the job and erected. The Security Culvert unit is properly designed to resist bending and securely fastened to prevent motion of any kind in any direction when assembled.

The forms in which the Security Culvert units are made are designed to prevent any mishap in the arrangement of reinforcing, and also to prevent any variation in the thickness of the unit.

These features insure full strength and make our system fool-proof.

We will furnish the entire outfits of forms and tools necessary for their manufacture, provided you want territorial rights. Here's your opportunity to secure a most modern and a most splendid system of culvert construction yet devised. It is up-to-the-minute. Once seen always in demand. The enterprising man of your vicinity will be sure to grasp this opportunity the minute he sees it. Are you the man of enterprise?

Inquiries will be given prompt attention and full information furnished. Don't put it off—it may be the very thing you have been waiting for.

THE SECURITY CULVERT CO., Minneapolis, Minn.

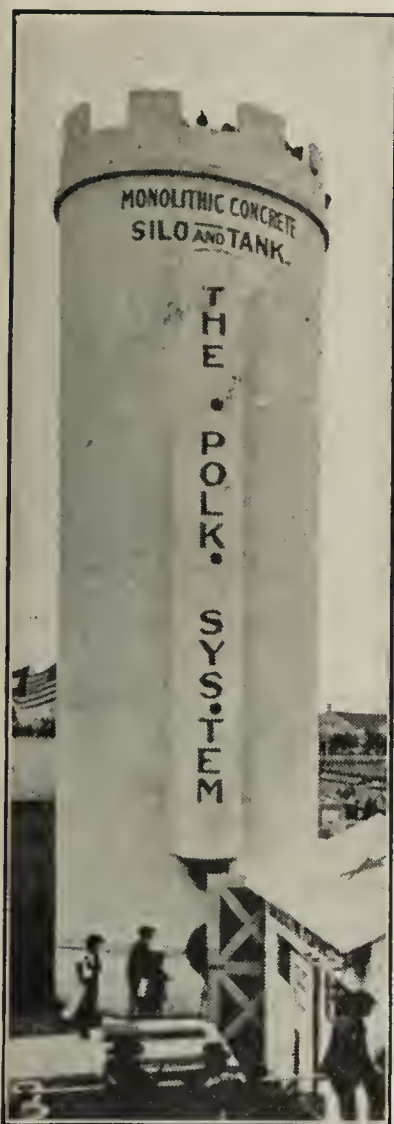
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The most profitable business open to you as a concrete man is the erection of monolithic concrete silos. Experience has taught us that the man who has a big, busy building season is the man who plans, advertises, and gets his contracts during the early winter. We believe particularly in preparedness for prosperity.

Would you not be glad to look over the new POLK SYSTEM advertising and contract-getting proposition? It offers excellent opportunities for you to work up a big business for next season. Then if everything looks good to you and you see your income assured, you make your investment. We sincerely believe that we have the safest and sanest proposition ever put up to the concrete contractor. *Write us today.*

WHY NOT?

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FORT BRANCH, INDIANA



They are not built of pieces
and they cannot go to pieces

A New Principle Invented in Cement Stave Silo Construction A Needed Improvement. Silos, Tanks, Etc., Built Any Size Desired

Mr. S. T. Playford, the originator of cement stave silos, has purchased an absolutely new type of silo. Those who have seen it—and who have made searching comparison with Mr. Playford's earlier efforts in cement stave silos, are united in saying that this invention creates a new standard by which silos must now be judged.

This new silo will be known as the S-T-P. The S-T-P Silo embodies the latest, up-to-date knowledge and experience in silo building. Being a new silo, we are not forced to cling to old ideas, patterns and machinery. We have in the most original manner produced a silo that is strikingly different—a silo of incomparable strength and matchless durability and efficiency. The S-T-P will enable you as a contractor to offer an A-No. 1 business proposition to the farmer. The

S-T-P Silo

“SILO THAT'S PERFECT”—Invented by W. A. Hillman

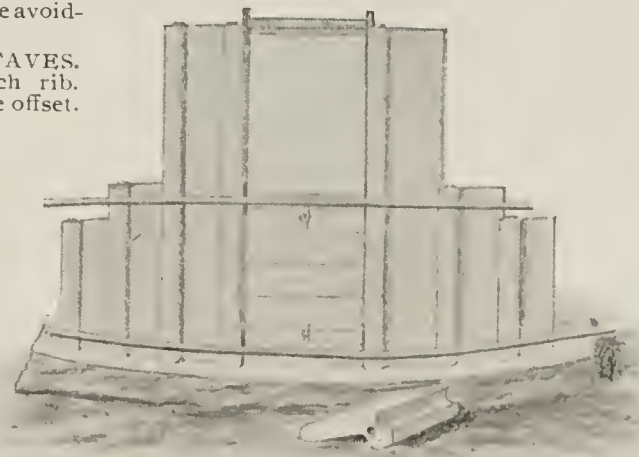
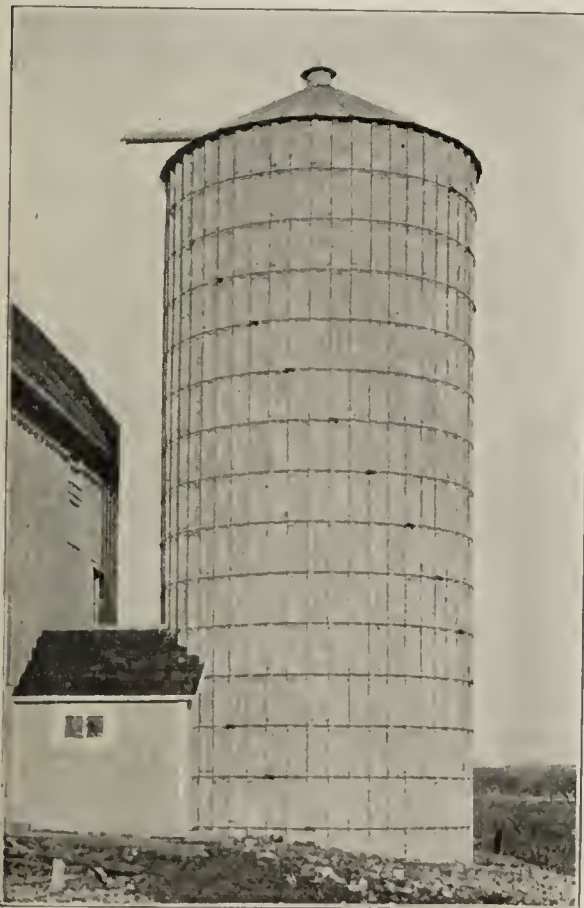
The more you know about silos, the more you will appreciate the S-T-P. The less you know about silos the more important it is that you learn about the “S-T-P.” It means the avoidance of dissatisfaction and money losses.

The “S-T-P” is made of SLUSHED STAVES. Thoroughly reinforced. Has a 4½ inch rib. Pointed up on the outside. The hoops are offset. This to give a ladder to work upon.

*Write for circular,
prices and further
information*

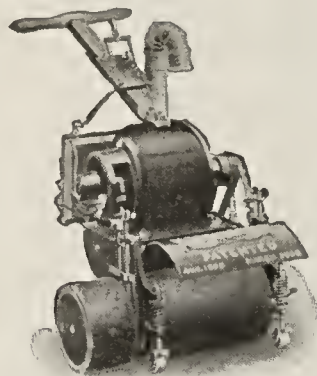
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MFG. CO.**

**298 Douglas Avenue
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The same as into wood. In use since 1906 and absolutely practical

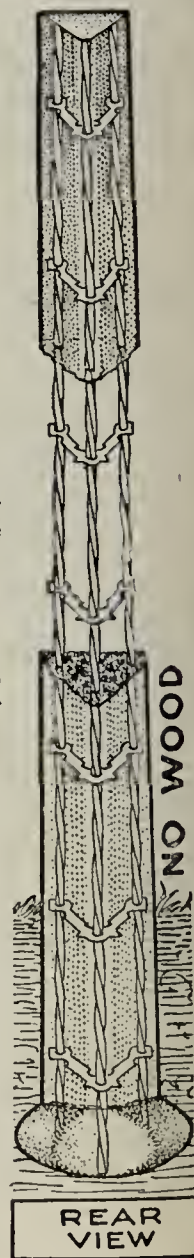
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USED FOR EXTERIOR FINISH OF
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MEDUSA White is an indispensable material for permanency, beauty and elegance in stucco, building ornamentation, concrete building blocks, interior decoration, statuary, cemetery work, setting marble, etc., and its artistic possibilities are unlimited. It is to be used in the same manner as ordinary Portland cement from which it differs in no respect except in its pure white color.

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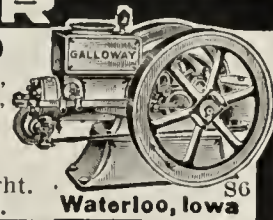
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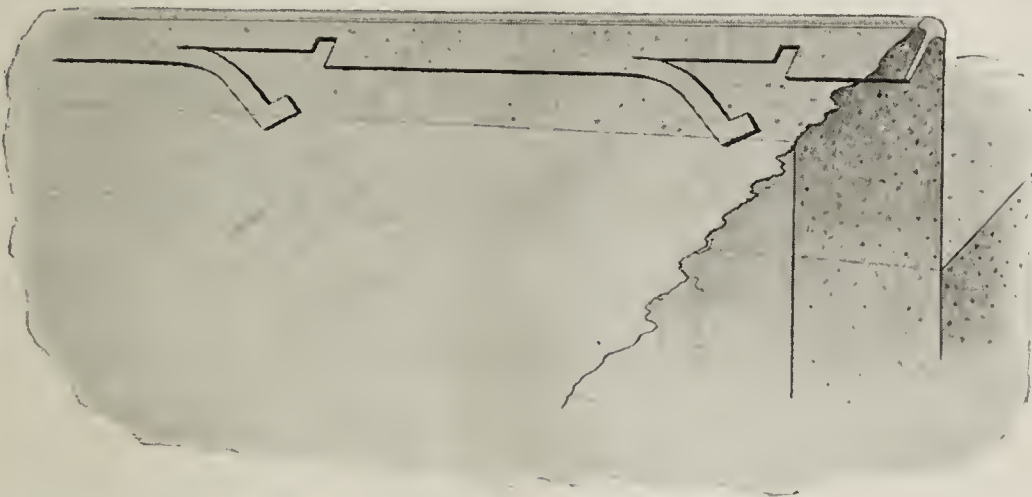
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The anchors of our hook bar are parts of the bar and extend deep into the body of the concrete, thereby fastening the curbing in a most positive and powerful manner.

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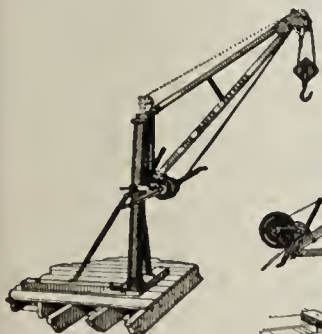
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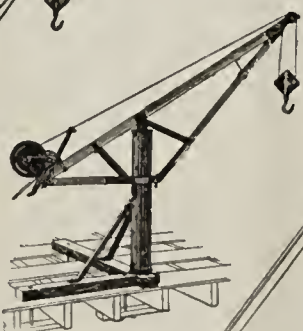
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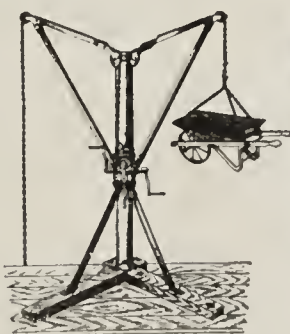
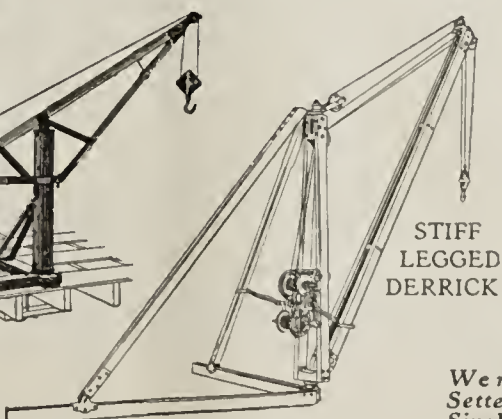
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For many reasons, blast-furnace slag is an ideal concrete material—its alkaline nature, tending to prevent rust in reinforced concrete—its light weight, enabling it, in floor slabs for instance, to support a given live load with smaller dead load on supporting frame—its contents of silica, alumina and iron, which increases the permanency of any concrete of which it is a part—its fire-resisting qualities—these are some of the features which have impelled the most careful engineers and architects to specify slag in place of other concrete aggregates.

The high crushing strength of slag-concrete has been demonstrated in various tests made of unprejudiced parties in nearly every large city. Slag-concrete has always developed strength uniformly higher than gravel-concrete or limestone-concrete.

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Blast-furnace slag as a concrete material is better understood than it used to be. Before you write your concrete specifications, get in touch with any of the following competing producers of blast-furnace slag—let them submit the results of long-time tests of slag-concrete.

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For the painstaking contractor who takes pride in building first-class sidewalks, curbing and foundations, as well as the highly capitalized construction companies building speedways, skyscrapers and subways, which must be first-class—there is a Lansing

and They're Always on the Job

One contractor is operating 5 number 15 Lansing Mixers on the New York Municipal Railway, Sea Beach Line in Brooklyn—open cut with concrete retaining walls and the intersecting streets carried on concrete arches.

Instead of concentrating a few big mixers down in the cut and hoisting his concrete up—he keeps his five Lansings up on the street level and pours the concrete down.

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So, on a small scale, do the smaller contractors register a saving through the use of Lansing Mixers.

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SIDEWALK FORMS CURB AND GUTTER FORMS

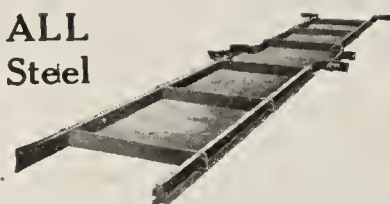
The contractor who bids on sidewalks, curbs, curb and gutters with the idea of using wooden forms is generally bidding under a definite handicap and will always do the work with less profit than he could with steel forms.

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Sidewalk Curb, Curb and Gutter

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The chances are that it might pay you to discard your old mixer after you see the X-L All Special and we know it will pay you to investigate if you have use for a concrete mixer.

Burrell Manufacturing & Supply House
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There's Sense in Steel

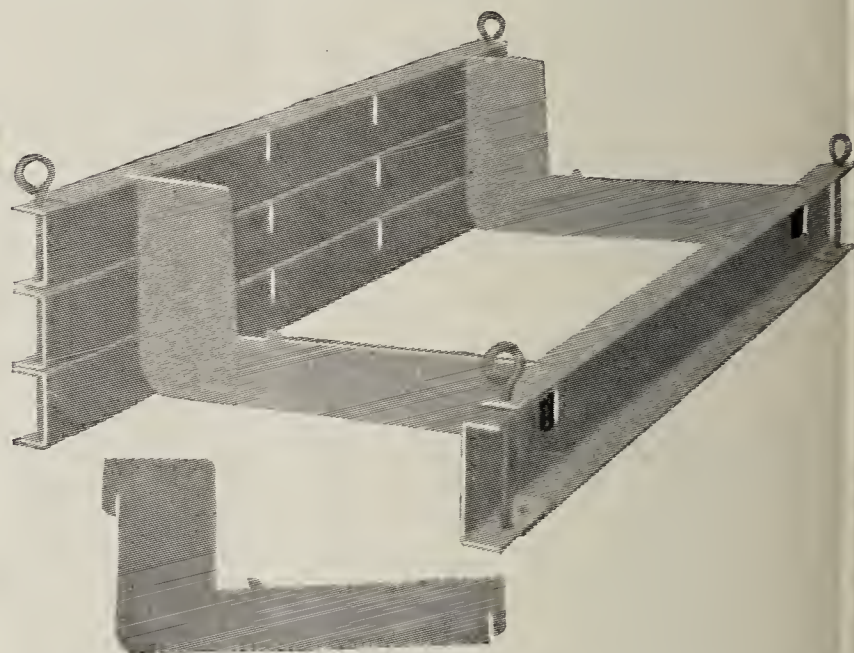
just as well as there are **cents** in the use of
Indiana Steel Forms.

For **\$13.⁷⁵**



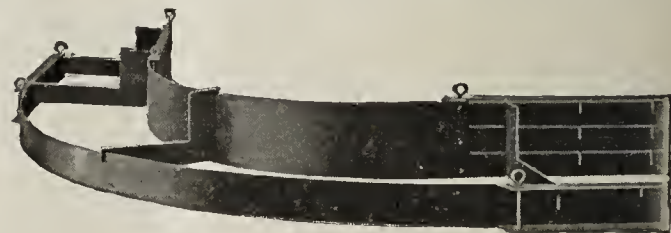
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The sense of buying these particular **steel** forms for
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Steel Forms mean permanent equipment.
That's why many of the largest and smallest con-
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Indiana Concrete Mold Co.

216 East River St.,

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Investigation and Experience Are Proving the Reliability of Hydrated Lime for Waterproofing

Concrete Work. Architects, Engineers and Contractors everywhere are being interested in and are investigating the worth of Hydrated Lime as a waterproofing. Experience and actual application are proving to them beyond shadow of doubt that **HYDRATED LIME** is reliable, permanent and harmless.

It is usually employed in proportions of about 10 parts of lime to 90 parts of cement, or 10% of the cement is replaced with the lime.

Hydrated Lime is an extremely fine material, being much finer than the finest Portland cement; hence the material fills the voids in the concrete mass, making a denser and therefore more nearly waterproof substance.

THE reinforced concrete standpipe at Westerly, R. I., and illustrated herewith, was waterproofed with Hydrated Lime. The contractor says, "As the tower is to be made watertight simply by the density of the concrete, great care is being exercised in the choice of aggregate and cement and in the methods of mixing and placing. Frequent and accurate analyses are made to determine the voids in the sand and stone, so that the proper proportions of aggregate and cement to secure the maximum density of concrete may be used. About the average mixture by volume is one yard of stone to one yard of sand; 2-5-11 barrels of cement to one yard of concrete and about 5 per cent of hydrated lime.

Another large concrete tank has been successfully waterproofed with Hydrated Lime. The new 250,000 gal. reinforced concrete tank, 50 ft. in diameter, 16 ft. deep and with 8-in. thick walls, built by the R. L. Whipple Company, Worcester, Mass., for the artillery post at Ft. Strong, Boston Harbor, has been found to be absolutely water tight. Great care was exercised in proportioning and mixing the concrete. The mix was 1 cement to 4½ gravel, to which 5 per cent hydrated lime was added.

Hydrated Lime is shipped in 40 or 50 lb. paper bags, or 100 lb. burlap bags. It is a dry, unpalatable powder, which can be easily and safely stored.



Concrete Standpipe Waterproofed with Hydrated Lime

Full detailed information of the methods and cost of using this material may be secured from any of the following competing manufacturers of Hydrated Lime:

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Ohio & Western Lime Co., Huntington, Ind.	White Marble Lime Co., Manistique, Mich.	National Lime & Stone Co., Carey, Ohio.	Dittlinger Lime Co., New Braunfels, Tex.
Security Cement & Lime Co., Hagerstown, Md.	Ste. Genevieve Lime Co., St. Louis, Mo.	John D. Owens & Son Co., Owens, Ohio.	Round Rock White Lime Co., Round Rock, Tex.
Tidewater Portland Cement Co., Baltimore, Md.	Dutchess County Lime Co., Dover Plains, N. Y.	Woodville Lime & Cement Co., Toledo, Ohio.	Riverton Lime Co., Riverton, Va.
Lee Lime Co., Lee, Mass.	The A. & C. Lime Co., Canton, Ohio.	Rapid City Gypsum, Lime & P. C. Co., Rapid City, S. D.	International Lime Co., Sumas, Wash.

Salesman with engineering experience wanted on commission basis by reputable engineering concern manufacturing modern machinery and installations for collecting dust of all kinds of industrial plants. Excellent opportunity for man with good industrial connections. References and full information required. Address Box 105, care Cement & Eng. News, 672 Transportation Bldg., Chicago.

WANTED

Position as Chief Engineer, Master Mechanic or Superintendent in the Cement Manufacturing business, by a practical man in that line. Address, Chas. F. Nolen, Box 13, Alsen, N. Y.

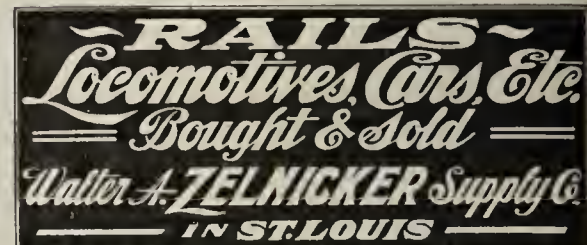
Advertising Man — Young newspaper man, formerly cement chemist, would like position in advertising department of cement company. Six years' experience in manufacture and testing of cement through the Middle West. Two years in newspaper work. Address H. A., c/o Cement & Eng. News, Chicago.

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A chemist, college graduate, four years' successful experience as a cement chemist, desires a position. References furnished. Address T. A., care Cement and Engineering News, 672 Transportation Bldg., Chicago.

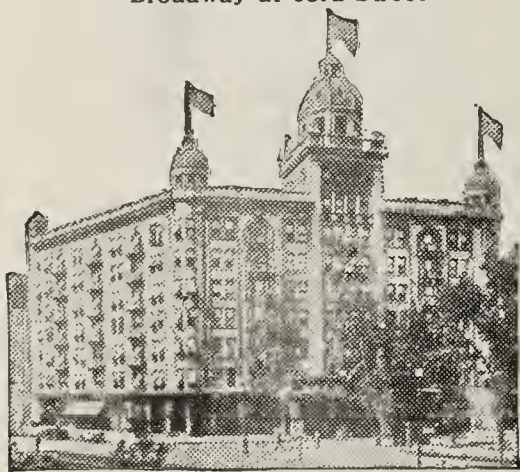
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We can save you 25 to 50 dollars on a concrete mixer. High grade machines, fully guaranteed. Get our price before you buy. Superior Mfg. Co., 1405 Concrete Ave., Waterloo, Iowa.



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Concrete Plants, Contractors, Etc.

Secure our confidential processes, methods and formulas and make concrete marble granites, sanitary flooring, etc., and make money.

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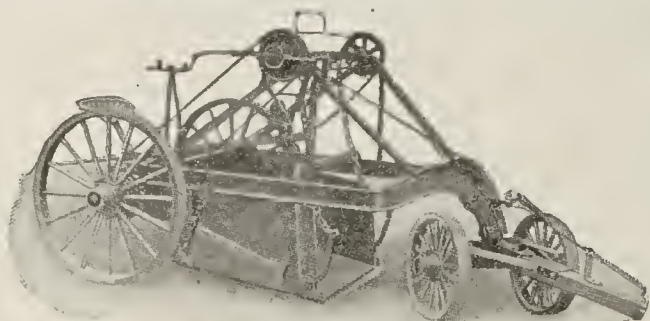
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Cheap Subgrade Excavation!

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"The Self-Loading Dump Wagon"

Gets Double the Output of Old Style Wheelers at little more expense. An outfit can move from 400 to 500 cubic yards in ten hours. Hundreds of paving contractors use Maney's. Write at once for catalog and prices.

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For Bathrooms, Kitchens, Hallways, etc.

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Hollow Cement Building Blocks WITH GRANITE FACES



8x8x24 inch Granite Smooth Face Block

*They Cost Less
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Enlarged View of Granite Smooth Facing

BY A NEW process, which protects the facing, while the block is being cast, we eliminate all traces of cement from the face of block and nothing but the GENUINE GRANITE SHOWS IN ALL ITS SPARKLING BEAUTY.

These cuts show blocks just as they came from the molds, they are not treated with acid or scrubbed with brush, or sprayed.

We challenge the whole world to show us a cement block, made by any other system, at any cost, that equals these blocks for beauty, strength, quality or imperviousness to heat, cold or moisture.



8x8x24 inch Granite Rock Face Block

Send us fifty cents and we will send, freight prepaid, to any point in the United States, east of the Mississippi and north of the Ohio Rivers, a granite-faced block, one-half rock-faced and one-half plain-faced. **YOU WILL SAY WHEN YOU GET IT THAT YOU NEVER SAW A CEMENT BLOCK BEFORE.**

They are positively cheaper to make than the ordinary dry-tamp, sand faced block.

MR. BLOCK MAKER: What show will you have if your competitor secures the exclusive right for this system in your city?

ASK US ABOUT OUR MOLDS FOR MAKING SILO BLOCKS.

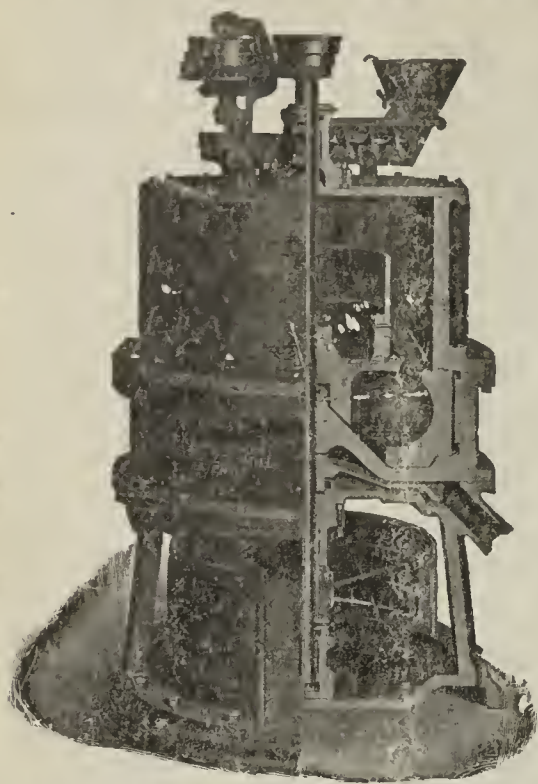
Send for a Catalog fully describing our system and showing our multiple molds mounted on trucks, for casting hollow cement building blocks.

Zagelmeyer Cast Stone Block Machinery Company

25 Crump Avenue

BAY CITY, MICHIGAN

The Fuller-Lehigh Pulverizer Mill.



Produces Commercially

Cement having a higher percentage of Impalpable Powder than can be obtained by any other mill. Tests show that the tensile strength of a 1-5 mortar made with cement pulverized by the Fuller Mill is higher than the tensile strength of a 1-3 mortar made with cement pulverized to the fineness required by the Standard Specifications.

Lehigh Car, Wheel & Axle Works

Main Office: Catasauqua, Pa.

New York
N. Y.

Hamburg
Germany

Cement Companies
equipped with
Fuller Mills
advertise the fact that
The consumer
gets
38 pounds more
of the
Impalpable Powder
or
Real Cement
in every barrel of
cement produced by
The Fuller Mill
than by any other.



"OLD RELIABLE" "XX"—Our Motto is "QUALITY FIRST"

You may buy some cheaper grades of Shovel Chain than "XX" but our High Grade "XX" Chain is always cheaper in the end. Send for catalogue and prices.

"OLD RELIABLE"
"XX" SHOVEL CHAIN

Some manufacturers make several grades of so-called Shovel Chain. We make one grade.

Made only by THE HAYDEN CORBETT CHAIN CO.,

Columbus, Ohio

FALSE RUMORS

Contrary to current rumors, exceptional demands for military powders do not affect our productions of Blasting Powder, Dynamite and Sporting Powder.

Extensive plants, large stocks of materials, ample storage and shipping facilities enable us to accept and promptly complete contracts for products of DU PONT standard.

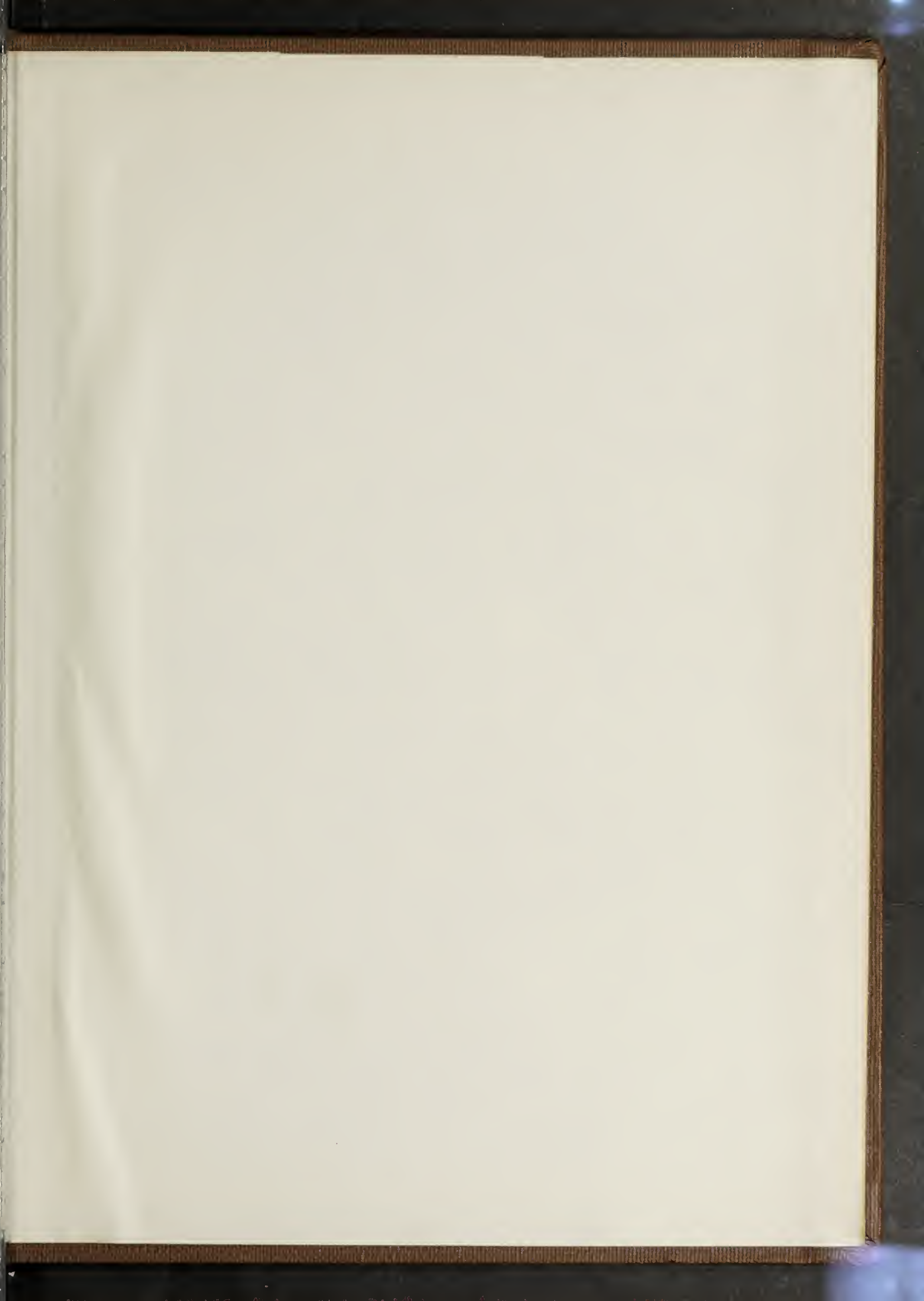
Specify DU PONT and be assured of prompt shipments of explosives of known efficiency.

E. I. DU PONT DE NEMOURS & COMPANY

Powder Makers Since 1802

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